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ABSTRACT

Under the Idaho state system for curriculum development in vocational education, Technical Committees made up solely of industry personnel are responsible for drawing up task lists for each program. Accordingly, a task list for dental assistants was drawn up and used as a basis for revising the curriculum guide for fundamentals of dental assisting and expanded functions. The two volumes of the guide contain seven modules. Module 1, Fundamentals for Dental Assisting, consists of an instructor's guide with teaching guidelines, supplemental module, and a module on introduction to dental materials. Module 2, Applications of Pit and Fissure Sealants, includes a self-study module with course description, evaluation form, informational material, study questions, and references. Module 3, Temporary Crown Restorations, provides an instructor's guide detailing course requirements, materials and supplies; testing procedures; and a student module with course outline, informational material, and study questions. Module 4, Polishing Amalgam, consists of a self-study module with course outline, evaluation form, informational material, study questions, and references. Module 5, Aiding in the Administration of Nitrous Oxide-Oxygen Analgesia, contains an instructor/student module with course outline, informational material, self-examination, and bibliography. Module 6, Taking Alginate Impressions, provides a self-study module with course description, evaluation form, information material, study questions, and references. Module 7, Coronal Polishing, consists of an instructor's guide with a synopsis, outline of kinds of background knowledge students should have, lists of terminology and objectives, student module with course outline, informational material, and study questions. Each module contains a final examination with answer key. (YLB)

ED354307

Vo. Ed. #258

Curriculum Guide for FUNDAMENTALS OF DENTAL ASSISTING AND EXPANDED FUNCTIONS

Volume 1-2

Invest in Success

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DIVISION OF VOCATIONAL EDUCATION

650 WEST STATE STREET BOISE, IDAHO 83720-3650 (208) 334-3216 FAX (208) 334-2365

March 4, 1992

Greetings:

The Division of Vocational Education is pleased to provide you with this State Curriculum Guide as a part of our commitment to your efforts in conducting quality educational programs for students who are preparing for employment in meaningful and rewarding occupations.

We know that a great deal of time and effort goes into the operation of a Vocational Education program, and we applaud your local efforts to make these programs available for students. This State Guide should assist you in these efforts.

The competency-based State Guide was developed from a Technical Committee Report prepared with the assistance of industry personnel. The Report includes a Task List which is the basis for the State Guide. The Tasks identified in the Technical Committee Report were representative of the competencies needed by a worker to be hired or employed in Idaho businesses.

Vocational Education has adopted the Competency-Based approach as the primary method of delivering Vocational Education skills to students. Competency Profiles are available for each student enrolled in programs as a means of recording student progress. The Profile is used as a student record when additional training is sought -- aiding in the program articulation process. The Profile also communicates to employers those skills the student has mastered.

We hope you find this document useful. Your comments are welcome!

Trudy Anderson, Ph.D.
Administrator

INTRODUCTION

The curriculum development process undertaken by the Idaho Division of Vocational Education involves the active use of industry personnel. Industry personnel comprise the sole membership on Technical Committees which are responsible for the development of Task Lists for each program. A Technical Committee Report is prepared on completion of the Committee's assignment. This publication is the Technical Committee Report.

The Task List prepared in the Technical Committee Report reflect the current trends and skills necessary for an employee to: 1) Obtain a job in Idaho's industry, 2) retain a job once hired, and, 3) to advance in the occupational field. Task Lists are grouped according to Duty areas generally used in industry settings. Duty areas are used as the basis for modules in the Statewide Curriculum Guide development process. The Technical Committee segment is the single most significant step in the curriculum development process. All future curriculum activities are predicated on the premise that an accurate picture of industry needs are reflected in the Task List.

Instructional personnel are selected to develop the Statewide Curriculum Guide. These instructors write Performance Objectives for each Task and the subsequent Enabling Objectives for each Performance Objective. The committee members prepare all material in a competency-based format so as to have an effective and efficient methodology for determining student progress. The Statewide Guides are designed as the prime determiner of program content. All programs must follow the established Guide in order to be approved for operation. Any deviation from this Guide requires written approval from the respective program supervisor at the Division of Vocational Education. It is not the intent of the Division that all programs be designed to be exactly the same, but assurance is needed to ensure that the program meets the minimum standards for operation, based on the community needs, equipment, and facilities available to the local school or institution.

The Technical Committee Report does not dictate the level of instruction The Task List developed represents the entire occupational field. Schools and Institutions determine what skills can be taught and what depth of instruction can be provided. They must choose the Tasks to be taught from the Technical Committee Report but are free to determine how many or which ones can be incorporated into their program.

The Technical Committee Report is also used as the primary list for generating Student Profiles. These Profiles are used as a cumulative record of each student's progress. They are printed in a folder format and have levels of performance scales for each Task so that student competence can be recorded for individual skills or tasks. This document will become the main component for Articulation activities in the event that the student desires to go on for additional training or education.

ACKNOWLEDGEMENTS

The curriculum guide for Dental Assisting was revised to include the additional expanded functions for Dental Assistant. It was determined that it was necessary to update the Fundamentals component as well in order to have all segments as technically current as possible. The Division of Vocational Education enlisted the assistance of a Technical Committee to develop a task list for Dental Assistants and utilized this task list as a basis for revising the curriculum guide. The Technical Committee Report for Fundamentals of Dental Assisting is available from the Division as a separate publication.

A team of writers comprised of faculty from the Dental Hygienist program at Idaho State University was assembled to rewrite sections of the existing guides and to develop the new Expanded Functions components needed. We are indebted to the following people for their assistance in preparing the Curriculum Guide for Dental Assisting: Denise Bowen, Kelly Reich, LuAnn Spain, Carlene Paarman, Carole Christie, Carole Kawamura, and Lisa S. Fleming. The following people served on the Technical Committee: Dr. Richard Smart, Coeur d' Alene; Dr. Curtis Eastin, Coeur d' Alene; Dr. Skip Pierce, Boise; Dr. Lon Blair, Boise; Dr. Timothy Thompson, Twin Falls; Janet Ingrao, Nampa; Debbie Russell, Boise; Dr. Anthony Wolff, Nampa; Jerry Davis, Boise; Sylvia Boyle, Boise; and Denise Bowen, Pocatello.

A training seminar was conducted in Pocatello for instructors from the six Postsecondary Vocational Technical Schools following the development of the guide. Instructors who attended this seminar were selected by the respective postsecondary school and are expected to serve as the trainer for other Dental professionals in their region. Each Vocational institution will offer the Dental Assisting program in on-campus or off-campus courses to Dental professionals in an attempt to upgrade the skills of the Dental Assistants employed by Dentists. We are confident that the health of Idaho residents will be improved through the efforts of the dedicated professionals who assisted the Division in developing these instructional materials.

Dorothy Witmer, Supervisor
Health Occupations Education

Don Eshelby
Director of Program Services

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Vo.Ed. #258

CURRICULUM GUIDE

FUNDAMENTALS OF DENTAL ASSISTING AND EXPANDED FUNCTIONS

Volume 1

March, 1992
State Division of Vocational Education
650 West State Street
Boise, Idaho 83720

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Module 1

FUNDAMENTALS FOR DENTAL ASSISTING

Module 1-A

FUNDAMENTALS FOR DENTAL ASSISTING

Instructor's Guide

FUNDAMENTALS FOR DENTAL ASSISTING

INSTRUCTOR'S GUIDE

Developed by

Kelly Reich, RDH, BA

Idaho State Board for Vocational Education
650 West State Street
Boise, Idaho

1991

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EXAMINATION FOR FUNDAMENTALS FOR DENTAL ASSISTING....6

Clock Hours: 36
Self Study: 36
Clinical: Optional

FUNDAMENTALS FOR DENTAL ASSISTANTS

This course is designed to provide the student with basic background and knowledge in the areas of sterilization, charting, terminology, ethics and jurisprudence, local anesthesia and cavity classification. It is a prerequisite to the course "Expanded Functions for Dental Assistants."

I. Dental Terminology (5 hours)

II. Ethics and Jurisprudence (6 hours)

III. Recording Dental Charting (6 hours)

    Introduction to Charting
    Charting Symbols
    Recording Services Rendered

IV. Infection Control (4 hours)

    Introduction to Disease Transmission/Control
    Sterile Instrument Preparation/Handling
    Disinfection

V. Auxiliary's Role in Administration of Local Anesthesia (3 hours)

    Basic Equipment
    Anesthetics
    Armamentarium Selection/Assemblage
    Assisting with Administration

VI. Cavity Classification (6 hours)

    Terminology Review
    Blacks Cavity Classification
    Components of Prepared Cavities
    Elements of Cavity Design

VII. Dental Materials (6 hours)

INTRODUCTION

This instructional guide is provided to aid the instructor in teaching the Vocational Education Dental Assisting Fundamentals course. It has been designed to serve only as a guide and can be implemented into the course at the discretion of the instructor.

The module, "An Introduction to Instructional Methodology" should be used as a reference when teaching the Fundamentals course. It offers suggestions for teaching and explains the importance of learning styles.

It may be helpful to design various exercises which will test the student's knowledge and learning style. The use of post-tests and multiple choice test items will help the instructor determine the level of learning for each student.

Additional references have been listed in the Supplemental Module for Fundamentals II. It would be advantageous for the instructor to read the articles, since they would provide a broader knowledge base for teaching. It also is suggested, in the Supplemental Module for Fundamentals II, that the student read the articles. It is impossible to expose the student to all of the information that is available, so additional reading is necessary.

The following guidelines are intended for use with the Supplemental Modules Fundamentals I and II. Some of the ideas and suggestions also could be used in teaching the Ethics and Jurisprudence and Dental Materials Course.

Refer to the course outline for course description, course texts, clock hours, and course requirements. Evaluation/Grading is based upon the final examination. Instructions for administering the exam, a copy of the final examination and an answer key are attached.

GUIDELINES FOR TEACHING

FUNDAMENTALS I AND II

FUNDAMENTALS I

Read the Colwell Self-Instructional Module and the coinciding Supplemental Module for Fundamentals I and suggested readings. Review the Instructional Goals.

Additional information has been added to the Dental Terminology portion of Fundamentals I (in the Supplemental Module). Dental terms are related to the subject matter covered in the chapters.

Incorporate the material from the Supplemental Module and the suggested readings into the lecture portion of the class.

Additional dental terminology has been provided in the Supplemental Module and should be used in conjunction with the Chapter 12 Glossary (in the Colwell Self-Instructional Module). The terminology applies to new material covered in the Supplemental Module for Fundamentals I and II, and Dental Materials.

SUGGESTED CLASSROOM ACTIVITIES

As simplistic as it may seem, some individuals have a difficult time with the pronunciation and spelling of dental terms.

1. It may be advantageous for the student to have a spelling review. Terms may be selected at random and the student must correctly spell the word. To further test their knowledge of the word, a definition must also be written.

   Depending on the time frame, you may want to correct the tests, or have the students correct their own tests. Allow for additional time outside of class, if you are evaluating their work. As an instructor, you may have a better understanding of their progress if you evaluate their tests.

   It is essential that any time student questions are given, or a quiz is administered, the material is reviewed during classroom time. This classroom review allows the student to participate in classroom discussions, and to ask questions that may arise at the time of discussion.

2. The next type of classroom activity must involve everyone's participation. Depending on the class size, you may want to do this activity at two separate times. A topic is chosen by the instructor, (e.g., dental charting) and the student must

write one question and answer on the subject. The student must sign their name, and the papers are collected. The instructor will randomly pick a student, excluding the person who wrote the question, and present the question. If the student does not know the answer, the class should participate and answer the question.

The student's answer on the paper should be checked. A note should be made if the answer is incorrect.

3. Role playing is another activity that allows the student to speak on a subject that may be difficult for them. The activity may center around situations that may arise in the dental office, and how they would handle the situations.

   Patient rapport, explanation of dental procedures to the patient, and charting symbols are examples of subjects that may be used in role playing.

Note: Five hours has been allowed for teaching Fundamentals I. It will be at the instructor's discretion to decide how this time will be used. It is suggested that a portion of this time be used in preparing for class and student evaluation.

FUNDAMENTALS II

Infection Control

Review the Instructional Goals for Chapters One, Two and Three in the Colwell Self-Instructional Module for Fundamentals II. Additional instructional goals have been added in the Supplemental Module pertaining to the topics of: Infection Control, Herpes Simplex, AIDS, Disinfection and Sterilization .

Before beginning the Colwell Self-Instructional Module for Fundamentals II, read the Instructional Guidelines for Completing Fundamentals II.

The information in the Supplemental Module is designed to be taught in conjunction with the Fundamentals II material. The information from the Supplemental Module and the suggested readings should be incorporated into the lecture portion of the class.

An instructional program and three videotapes have been incorporated into Fundamentals II. The following instructions should serve as a guideline for incorporating the material into the course.

1. First read the instructional program "Infection Control in the Dental Environment" produced by the American Dental Association. It contains current information on infection control, and infection control practices. This manual is for the instructor's use only and will not be provided to students.

2. A review of literature is also included with this information. Some material does not pertain to dentistry, so it may be necessary to decide what is pertinent for your particular class. It has been stressed throughout the Supplemental Modules, to refer to additional information to help gain a better understanding of the subject matter. Additional references have been listed in the Supplemental Module for this reason.

   It is important when teaching Infection Control, that the information is presented in a systematic and logical manner. Organize the topics and present the information in small steps.

3. Review the Instructional Goals for each chapter with the class.

4. The ADA videotape entitled "Principles and Fundamentals of Infection Control", should be shown after reviewing Chapters One and Two in the Colwell Self-Instructional Module.

5. Sterilization and Disinfection (Chapters Three and Four), should be completed in the Colwell Self-Instructional Module before showing the ADA videotape entitled "Sterilization and Disinfection."

6. The ADA videotape entitled "Clinical Procedures" should be shown after the information concerning proper infection control procedures has been covered in the classroom. Presenting this information first will give the student a general understanding of the subject, as the videotape is more specific.

7. Study questions have been included in the Fundamentals II, Supplemental Module. The questions include new information from the Supplemental Module.

   The test may be given after the infection control information and videotapes have been covered.

CLASSROOM ACTIVITIES

1. If a dental office is available, it would be helpful for the student to practice proper infection control procedures.

   Access to dental materials would be helpful, but not necessary. The dental unit could be set up for pre-treatment, patient, and post-treatment procedures.

   Each student would demonstrate or describe setting up for a dental procedure. Questions should be asked during the demonstration, to assure that the student understands the rationale for infection control.

2. Role playing may be helpful to demonstrate how many times cross-contamination can occur during a procedure.

   A dental office is not necessary, but may be useful. Two students would work together, one playing the role of the operator and the other as the chairside assistant. They could re-enact a dental procedure and demonstrate how to avoid cross-contamination. Suggestions for avoiding cross-contamination would be given by the instructor as the role playing occurs.

3. If possible, additional time could be set up to review the videotapes while other classroom activity is taking place.

   An additional six hours has been allowed for teaching Fundamentals II. The Infection Control section of the Colwell Self-Instructional Module has been updated. Minor changes were incorporated in the Local Anesthesia section.

   The approximate viewing time for the three videotapes is one hour. Preparation time for classroom instruction will depend on the individual instructor. Classroom activities should be incorporated into Fundamentals II, the length of time for these activities will be at the discretion of the instructor.

4. The time allotted for the Colwell Self-Instructional Module, "Ethics and Jurisprudence" is six hours. No additional supplemental module is necessary for teaching this portion of the course. "Ethics and Jurisprudence" should be taught after Fundamentals II. It is suggested that a portion of this time will be used in preparing for class and student evaluation.

5. An additional module, "Introduction to Dental Materials" has been designed for Fundamentals for Dental Assisting. The time allotted for teaching this portion of the course is six hours.

Study items have been included in the module, and should be discussed as the material is covered in class. Suggested readings have been listed which may provide a broader knowledge base for the instructor and student. It is suggested that a portion of this time be used in preparing for class and student evaluation.

Introduction to Dental Materials is designed to provide the student with basic knowledge of dental materials. It is strongly recommended that the student seek additional experience in a dental setting to gain a better understanding of dental materials. "Introduction to Dental Materials" should be taught after "Ethics and Jurisprudence."

INSTRUCTIONS FOR ADMINISTERING THE FINAL EXAMINATION FOR FUNDAMENTALS FOR DENTAL ASSISTING

The final examination for Fundamentals for Dental Assisting should take the student approximately two hours and 30 minutes to complete. The student must achieve a minimum score of 80% to successfully pass the examination.

Matching terms, definitions, fill in the blank, and true or false questions are worth ONE point each. Multiple choice questions are worth TWO points each. There is only one correct answer for each question or statement. (Refer to the Answer Key provided.)

The calculated percentages for the Final Examination are as follows:

100 - 382
99 - 377
98 - 373
97 - 369
96 - 365
95 - 361
94 - 358
93 - 354
92 - 351
91 - 346
90 - 342

89 - 339
88 - 335
87 - 331
86 - 327
85 - 323
84 - 319
83 - 316
82 - 311
81 - 308
80 - 304

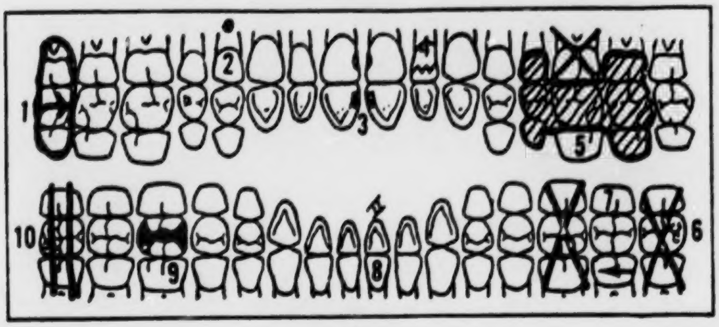
Module 1-B

FUNDAMENTALS FOR DENTAL ASSISTING

Final Examination

FINAL EXAMINATION

FUNDAMENTALS FOR DENTAL ASSISTANTS



ANSWER QUESTIONS 1 THROUGH 10 WHICH REFER TO THE DIAGRAM ABOVE. ENTER ANSWERS ON THE ANSWER SHEET PROVIDED.

1. This tooth is

   (a) maxillary right 3rd molar
   (b) impacted
   (c) growing mesially
   (d) tooth #1
   (e) all of the above

2. This tooth

   (a) is abscessed
   (b) has ENDO
   (c) is all right
   (d) has occlusal caries
   (e) none of the above

3. These teeth have

   (a) mesial caries
   (b) distal caries
   (c) abscesses
   (d) ENDO
   (e) periodontal mobility

4. This tooth is

   (a) abscessed
   (b) to be extracted
   (c) fractured
   (d) has ENDO
   (e) none of the above

5. This is a

(a) partial denture
(b) three-quarter crown
(c) 3-unit bridge
(d) abutment
(e) none of the above

6. This tooth is

(a) missing
(b) to be extracted
(c) impacted
(d) erupting
(e) drifting

7. This tooth is

(a) drifting mesially
(b) drifting distally
(c) O.K.
(d) impacted
(e) abscessed

8. This tooth is/has

(a) endodontic treatment
(b) Class II caries
(c) Class II mobility
(d) abscessed
(e) malocclusion

9. This tooth has

(a) MO caries
(b) DO caries
(c) Class II mobility
(d) abscessed
(e) malocclusion

10. This tooth is

(a) impacted
(b) missing
(c) to be extracted
(d) drifting
(e) erupting

MATCH THE FOLLOWING TERMS AND DEFINITIONS.

____ 11. INCISAL EDGE

____ 12. FACIAL

____ 13. LINGUAL

____ 14. OCCLUSAL

____ 15. DISTAL

(a) that surface of the tooth which is toward the tongue.

(b) that surface of the tooth which is toward the lips and cheek.

(c) the broad chewing surface of the posterior teeth.

(d) the cutting edge of an anterior tooth.

(e) the surface of the tooth which is toward the midline.

(f) the proximal surface of the tooth which is away from the midline.

16. The ____________________ and __________________ are the anterior teeth.

(a) canines and incisors
(b) incisors and premolars
(c) molars and canines
(d) molar and premolars
(e) premolars and canines

17. ________________ is the delicate relationship between the maxillary and mandibular teeth as they come together in normal functioning.

TRUE OR FALSE. MARK A T FOR TRUE, AND F FOR FALSE ON THE ANSWER SHEET PROVIDED.

____ 18. The name of a line angle is formed by dropping the "al" ending from the first name, adding "o" and combining this with the second name.

____ 19. Cavity walls are named for the nearest point angle.

____ 20. Obtaining the required convenience form is the first step in cavity preparation.

MATCH THE FOLLOWING TERMS AND DEFINITIONS.

____ 21. PERIODONTAL LIGAMENT

____ 22. GINGIVA

____ 23. ALVEOLAR RIDGE

____ 24. PERIODONTAL

(a) a series of bundles of fibers which support and suspend the tooth in its position within the bony socket.

(b) pathology which affects the tissues around the tooth.

(c) surrounding the tooth.

(d) the specialized oral mucosa that covers the alveolar bone and surrounds the tooth.

(e) the bony ridge which supports the teeth in their working positions.

25. The space between the tooth and the free gingiva is called the ________________.

(a) gingival sulcus
(b) gingivectomy
(c) gingivitis
(d) oral mucosa
(e) periodontal space

MATCH THE FOLLOWING TERMS AND DEFINITIONS.

____ 26. ENDODONTICS

____ 27. DENTAL PUBLIC HEALTH

____ 28. ORAL SURGERY

____ 29. ORAL PATHOLOGY

(a) that dental specialty concerned with the study of disease processes of the hard and soft tissues of the oral cavity.

(b) that dental specialty dealing with the extraction of teeth and with other surgical procedures on the jaws and oral tissues.

(c) that dental specialty which deals with the diagnosis and treatment of the pulp and periapical tissues.

(definitions continued on next page)

(d) that dental specialty which deals with the prevention and control of dental diseases and promoting dental health through organized community efforts.

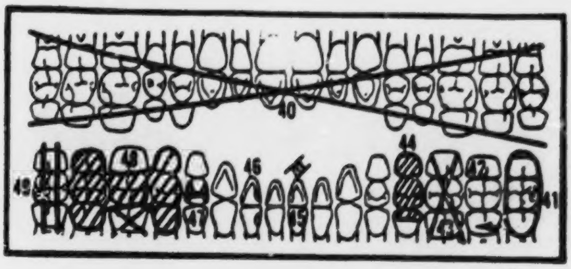
(e) That dental specialty concerned with the replacement of missing teeth.

30. The ________________ arch is movable.

(a) mandibular
(b) maxillary

31. The __________________ is the neck of the tooth.

(a) apex
(b) cervix
(c) dorsum
(d) frenum



ANSWER QUESTIONS 32 THROUGH 49 RELATING TO THE DIAGRAM ABOVE.

32. This is a/an

(a) edentulous maxillary arch
(b) edentulous mandibular arch

33. This tooth is

(a) missing
(b) drifting
(c) to be extracted
(d) impacted

34. This tooth is

(a) drifting mesially
(b) drifting distally
(c) impacted

35. This tooth is

(a) missing
(b) a pontic
(c) to be extracted
(d) impacted

36. This tooth has

(a) OL caries
(b) a full crown
(c) 3/4 gold crown
(d) inlay

37. This tooth is/has

(a) Class III caries
(b) Class III mobility
(c) 3 surface restoration

38. This tooth has

(a) abscess
(b) caries mesial
(c) caries distal
(d) fractured crown

39. This tooth has

(a) OL caries
(b) OF caries
(c) veneer crown
(d) MOD caries

40. This is a

(a) removable partial
(b) corrective appliance
(c) 3 unit-bridge

41. This tooth is

(a) impacted
(b) to be extracted
(c) missing
(d) extruded

MATCH THESE TERMS AND DEFINITIONS.

____ 42. CLASS I CAVITIES

____ 43. CLASS II CAVITIES

____ 44. CLASS III CAVITIES

____ 45. CLASS IV CAVITIES

____ 46. CLASS V CAVITIES

(a) Smooth surface cavities occurring in the gingival third of the lingual or facial surface of any tooth.

(b) Cavities in the proximal surfaces of the anterior teeth which require the removal and restoration of the incisal angle.

(c) Cavities in the proximal surfaces of the posterior teeth.

(d) Pit and fissure cavities which begin in structural defects of teeth.

(e) Cavities involving the abraded incisal edge or occlusal surface of a tooth.

(f) Cavities beginning in the proximal surfaces of the anterior teeth which do not involve the incisal angle.

47. On January 11, 1991, the maxillary right first premolar had the distal and occlusal surfaces restored with an amalgam restoration. Local anesthesia was used and a cement base was placed under the restoration. The correct "service rendered" entry for this would be:

(a) 11/1/91- #12 DO anes, C.B., amal
(b) 1/11/91- #5 DO anes, C.B., amal
(c) 11/1/91- #4 DO anes, C & B, amal
(d) 1/11/91- #5 DO anesthesia, amalgam

48. On December 10, 1990, the mandibular left second primary molar was extracted. Local anesthesia was used, a periapical x-ray was taken. The correct "service rendered" entry for this would be:

(a) 10/12/90- T anes, x-ray, ext
(b) 12/20/90- T anes, x-ray, ext
(c) 12/10/90- L anex, ext
(d) 12/10/90- K anex, x-ray, ext 7

MATCH THE FOLLOWING TERMS AND DEFINITIONS.

____ 49. INCISORS

____ 50. CANINES

____ 51. PREMOLARS

____ 52. MOLARS

(a) teeth with a broad working surface which is used for grinding the more solid of food which require the use of heavy forces.

(b) those teeth which will be replaced by permanent teeth.

(c) those teeth which have pointed cusps for grasping and tearing; however, they also have a broader surface for grinding and chewing food.

(d) those teeth with a thin, sharp cutting edge which are used for cutting and biting.

(e) the heavy teeth designed to cut and tear those things that are too tough for incisors to cut.

53. Facial caries in the buccal groove of a molar would be a Class ___ cavity.

(a) I
(b) II
(c) III
(d) IV
(e) V

54. From a facial/lingual view, a tooth is contoured so that it is ______________ near the occlusal surface and _____________ near the gingiva.

(a) narrower wider
(b) wider narrower

55. A ____________________ is formed where two walls of cavity meet along a line.

56. The ________________ is the sensitive living tissue of the tooth.

(a) cementum
(b) dentin
(c) enamel
(d) pulp

57. Adjacent teeth touch each other at their widest points. Where they touch is known as the ____________ point.

(a) adjunct
(b) contact
(c) embrasure
(d) occlusal

58. The _________________ is the tip of the root.

(a) cervix
(b) apex
(c) frenum
(d) dorsum

59. A ______________________ is formed where three walls of a cavity meet at a corner.

TRUE OR FALSE. MARK TO FOR TRUE, F FOR FALSE ON THE ANSWER SHEET PROVIDED.

____ 60. Enamel is the hardest tissue of the body.

____ 61. An abutment is a dummy tooth used to replace a missing tooth in a fixed bridge.

____ 62. An occlusal x-ray shows all of the teeth in the maxillary and mandibular arches in one film.

____ 63. Study models and diagnostic casts are two names for the same thing.

____ 64. Recording services rendered entries are always made in ink.

65. The chart entry for a tooth that has had an apicoectomy would be a ___________________ at the end of the root tip.

(a) circle
(b) dot
(c) straight line
(d) triangle
(e) zig-zag line

MATCH THE FOLLOWING TERMS AND ABBREVIATIONS.

____ 66. AMAL

____ 67. ANES

____ 68. S.T.

____ 69. F.T.

____ 70. C & B

(a) anesthesia

(b) suture treatment

(c) amalgam

(d) fluoride treatment

(e) cement base

(f) sedative treatment

(g) crown and bridge

71. A ____________________ is a localized area of infection at the tip of the root of the tooth.

(a) apical abscess
(b) periapical abscess
(c) periodontal abscess

72. _________________ is the hard, bone-like tissue covering of the root of the tooth.

(a) alveolar tissue
(b) cementum
(c) dentin
(d) enamel
(e) periodontium

MATCH THE FOLLOWING TERMS AND DEFINITIONS.

____ 73. CARIES

____ 74. MOBILITY

____ 75. DRIFT

____ 76. PERIODONTAL POCKET

____ 77. IMPACTION

(a) an area of infection.

(b) an area of the gingival sulcus that is more than 3 mm in depth.

(c) the disease process that results in the destruction of tooth structure.

(d) looseness of a tooth resulting from periodontal disease or from a blow to the tooth.

(definitions continued on next page)

(e) the shifting out of position of a tooth that has lost its neighbor.

(f) a tooth that is unable to erupt into position.

78. _____________ is a soft sticky mass of food debris, dead cells and bacteria that accumulates on the surface of the teeth.

79. The ___________________ is the gingival tissue that fills the apical embrasure.

80. ________________ is the bone-like substance which makes up the bulk of the tooth and forms the protective chamber for the pulp.

81. Complete periodontal charting includes ________________ pocket measurements on each tooth.

(a) 3
(b) 4
(c) 5
(d) 6
(e) 7

82. There are ________________ premolars in the primary dentition.

(a) 4
(b) 8
(c) 12
(d) none

83. Glutaraldehyde is used to disinfect__________________.

(a) instruments that cannot be sterilized with heat
(b) operatory surfaces
(c) tissues
(d) a and b

84. A/an _________________ biopsy is the removal of an entire lesion including some of the normal tissue around it.

(a) excisional
(b) incisional
(c) smear

85. A ________________ needle is used for infiltration anesthesia.

(a) long (1-5/8")
(b) short (1")

86. At the end of the patient visit, used gloves should be ___________________.

(a) discarded
(b) sterilized before being used again
(c) washed in an iodophor solution
(d) b and c

87. Clean barriers are placed in the operatory ________________.

(a) after gloving to begin patient treatment
(b) after removing gloves upon completion of operatory clean-up
(c) before removing gloves at the end of patient care
(d) while still gloved from cleaning the operatory

88. ________________ are cutting instruments designed to cut and contour bone.

(a) Bones chisels
(b) Rongeur forceps
(c) Scalpels

89. According to the standards recommended by the American Dental Association, sharp items should be disposed of in ______________.

(a) plastic bags
(b) puncture-resistant containers
(c) specially labeled containers
(d) a and b

90. Anything touched during patient care is said to be ________________.

(a) contaminated
(b) pathogenic
(c) virulent

91. __________________ can be transmitted by an accidental needle stick.

(a) Gonorrhea
(b) Hepatitis B
(c) Herpes
(d) Syphilis

92. A/an ________________ is usually performed in connection with endodontic treatment to control an area of infection.

(a) alveolectomy
(b) apicoectomy
(c) gingivectomy

93. The anesthetic cartridge is loaded into the syringe _________________ the needle has been attached to the syringe.

(a) after
(b) before

94. It is possible to tell if sterilization has taken place by the use of ___________________.

(a) heat sensitive tape
(b) process indicators
(c) spore tests
(d) a, b, or c

95. Handpiece spray is a form of _______________ disease transmission.

(a) carrier
(b) droplet
(c) personal contact

96. _______________ is the strength or disease producing capacity of a microorganism.

(a) Contamination
(b) Resistance
(c) Virulence

97. Burs __________________.

(a) may be put in the ultrasonic cleaner with other instruments.
(b) may not be put in the ultrasonic cleaner.
(c) should be put into a bur block before placing them in the ultrasonic cleaner.

98. If a tooth is abscessed, the dentist will ____________ the socket after the tooth is removed.

(a) aspirate
(b) curette
(c) disinfect

99. In the ultrasonic cleaner, the _______________ of the bubbles cause an unseen scrubbing action.

(a) explosion
(b) implosion
(c) supersonic action

100. ________________ is the destruction of all microorganisms on an object.

(a) Cold sterilization
(b) Disinfection
(c) High-level disinfection
(d) Sterilization

101. Codeine is ______________.

(a) a mild analgesic
(b) a moderate analgesic
(c) dispensed only by prescription
(d) b and c

102. Hands are washed __________________.

(a) after removing gloves
(b) prior to gloving
(c) a and b

103. A 30 gage needle is _____________ than a 27 gage needle.

(a) thicker
(b) thinner

104. A carrier may be an individual who has _________________.

(a) been exposed to the disease and never had it
(b) been exposed to the disease but has no symptoms yet
(c) recovered from the disease
(d) a, b and c

105. After use, rubber prophy cups should be ________________.

(a) discarded
(b) disinfected
(c) sterilized

106. If the patient has a history of ______________, the dentist will select an anesthetic with no epinephrine or neo-cobefrin anesthetic.

(a) heart disease
(b) high blood pressure
(c) serious medical problems
(d) a, b and c

107. Packs for autoclaving may be sealed using ________________.

(a) pins
(b) staples
(c) tape
(d) a, b or c

108. If the patient is to be given ___________________, he will be instructed not to eat or drink anything for a certain number of hours prior to the surgery appointment.

(a) general anesthesia
(b) premedication
(c) psychosedation

109. __________________ techniques are used to prevent contact with disease producing microorganisms.

(a) Barrier
(b) Disinfection
(c) Sterilization

110. A ________________ is used to keep the operating site free of blood.

(a) retractor
(b) stylet
(c) surgical aspirating tip

111. Local anesthetic solution with a 1:100,000 epinephrine ratio contains _____________ epinephrine than a 1:50,000 solution.

(a) less
(b) more

112. The super-heated steam in the autoclave penetrates the materials from the ________________.

(a) bottom up
(b) top down

113. When preparing a sterile field using a folded sterile towel, (the) _____________ is/are considered to be sterile.

(a) both surfaces
(b) inside surface
(c) outside surface

114. Maintaining your good health is the first step toward __________________.

(a) decreasing virulence
(b) immunization
(c) improving host resistance
(d) reducing pathogen concentration

115. ________________ gloves are worn when scrubbing contaminated instruments.

(a) Exam
(b) Latex
(c) Plastic
(d) Utility

116. A/an __________________ is a substance that kills microorganisms and is formulated for use on human tissue.

(a) antiseptic
(b) disinfectant
(c) germicide

117. According to the Centers for Disease Control, _______________ is the most critical infectious occupational hazard for the dental professional.

(a) AIDS
(b) hepatitis B
(c) herpes
(d) Tetanus

118. ____________________ has/have a corrosive effect on metals.

(a) Alcohol
(b) Iodophor disinfectants
(c) Quaternary ammonium
(d) Sodium hypochlorite

119. Dry heat sterilization at the temperature of 340° F requires _____________ minutes.

(a) 30
(b) 60
(c) 120

MATCH THE FOLLOWING TERMS AND DEFINITIONS.

____ 120. STATUTES OF LIMITATIONS

____ 121. CONTRACT

____ 122. TECHNICAL ASSAULT

____ 123. RESPONDEAT SUPERIOR

____ 124. CONTRIBUTORY NEGLIGENCE

(a) An agreement between two or more competent parties covering a specified lawful act for a consideration.

(b) "Let the master answer." An employer is held responsible for the wrongdoings of employees, if the wrongdoing was committed within the scope of their employment.

(c) The legal time limit within which a civil suite for an alleged wrong, such as malpractice, must be filed.

(d) Any professional misconduct or unreasonable lack of skill or fidelity in performance of professional duties.

(e) A wrongful act, intentional or inadvertent, involving contact between people which is not consented to, nor permitted by, social usage (even without injury).

(f) Failure on the part of the patient to follow the dentist's instructions both during and after treatment.

125. A/an ______________ is a means of assigning expanded functions in which there is a restrictive itemization of the specific tasks which may be performed by the auxiliary.

(a) list
(b) open provision

126. To legally withdraw from a case the dentist must notify the patient in writing of his intent at least 30 days in advance of the effective date of such withdrawal.

(a) true
(b) false

To be valid, a contract must have three elements. They are:

127. Those entering upon the agreement must be ______________.

128. The specific act must be ________________________________.

129. There must be a ____.

130. Complete the following statement, "The auxiliary has a legal duty to use ____ at all times."

MATCH THE FOLLOWING TERMS AND DEFINITIONS.

____ 131. ABANDONMENT

____ 132. LICENSURE

____ 133. ETHICS

____ 134. RECIPROCITY

____ 135. DENTAL JURISPRUDENCE

(a) A discipline dealing with good and evil and with moral duty.

(b) A wrongful act, except one involving breach of contract, for which the injured party can recover damages in civil action.

(c) Those laws, and interpretations thereof, that apply to and affect the dental profession from a legal standpoint.

(d) The granting of license expressly to practice a profession. Legal permission to engage in a profession or business.

(e) Desertion, or the practitioner's not being accessible to a patient under treatment at any time the patient may reasonably require assistance.

(f) An agreement between two or more states to allow an individual who is licensed in one state to receive, without further examination, a license in any of the other states entering into that agreement.

The four elements which must be present for a tort to have been committed are:

136. A ________________ is owed by someone to another.

137. The duty has been __________________ by the accused.

138. There was _______________________________ to the accuser.

139. The above was caused _____________________ by the accused's action.

140. Under the doctrine of Respondeat Superior the ________________ is responsible for the acts of the hygienist or other licensed employee.

The five (5) types of acts for which the dentist may be held professionally liable are:

141. ____

142. ____

143. ____

144. ____

145. ____

MATCH THE FOLLOWING TERMS AND DEFINITIONS.

____ 146. ADMISSION AGAINST INTEREST

____ 147. LIABILITY INSURANCE

____ 148. STATE BOARD OF DENTAL EXAMINERS

____ 149. EXPANDED FUNCTIONS

(a) The obligation, under law, of one person to another.

(b) The assignment to dental auxiliaries of greater skill and responsibility which were formerly performed by the dentist.

(c) Insurance coverage carried by the professional to protect him/her against the event of legal action.

(definitions continued on next page)

(d) An agency of the state in which it exists whose basic responsibility is to administer and enforce the Dental Practice Act of that particular state.

(e) A statement made by an individual which serves to defeat his/her own interests.

The five (5) factors necessary for valid consent are:

150. The one giving consent must be ______________________.

151. The consent must be _________________________________.

152. The consent is for a specific ______________________.

153. The act consented to must be _______________________.

154. Consent must not have been obtained by ______________.

MATCH THE FOLLOWING TERMS AND DEFINITIONS.

____ 155. REASONABLE SKILL, CARE AND JUDGEMENT

____ 156. CONSENT

____ 157. MALPRACTICE

____ 158. STATE DENTAL PRACTICE ACT

(a) To give permission for something to be done by another.

(b) Breaking of a contract by either party failing to keep his/her part of an expressed contract.

(c) The responsibility of the dentist, and auxiliary to possess and use that reasonable degree of knowledge and skill that is ordinarily possessed by practicing in the same community.

(d) Any professional misconduct or unreasonable lack of skill or fidelity in performance of professional duties.

(e) The state law which controls the practice of dentistry.

159. The terms malpractice and negligence are frequently used interchangeably.

(a) True
(b) False

The three (3) steps to be followed in the transfer of records are:

160. The records must be sent by ______________________________.

161. Request that they be kept on file for at least ____ years.

162. Keep on file: the request for records; a copy of the ______________________ and the postal receipt.

163. The medical history should be routinely updated ___________.

(a) at each appointment
(b) every six months
(c) at every other appointment
(d) yearly

164. Infection control procedures recommended by the ____________ should be adopted by all offices.

(a) Environmental Protection Agency
(b) Center for Disease Control
(c) State Health Agency
(d) American Dental Association
(e) b and d
(f) c and d
(g) b, c and d
(h) a, b and d

165. Composites are a combination of ________________________.

(a) simple and complex metallic elements
(b) any basic metallic, ceramic and polymer materials
(c) urethanes and silicones
(d) non-metallic elements

166. __________________ is an internal reaction, or resistance, within a body to an externally applied force.

(a) force
(b) strain
(c) stress
(d) tensile force

167. Malleability ________________ with increase in temperature.

(a) decreases
(b) increases

168. The Herpes Simplex Virus can survive on surfaces and hands for _______________.

(a) many hours
(b) an indefinite period of time
(c) one day
(d) one week

169. ___________________ types of Hepatitis are known.

(a) two
(b) three
(c) four
(d) none of the above

170. _________________ is the process by which dissimilar materials (molecules) are joined together.

(a) force
(b) viscosity
(c) adhesion
(d) wetting

171. The resistance to flow is known as ________________________.

(a) wetting
(b) adhesion
(c) visocity
(d) surface tension

172. __________________ may appear as a fiery red spot or a small pink spot on the buccal mucosa or tongue.

(a) hairy leukoplakia
(b) oral warts
(c) oral candidiasis

173. A person is said to have AIDS when an opportunistic infection such as ____________ is diagnosed.

(a) oral candidiasis
(b) pneumonia
(c) hepatitis B
(d) herpes simplex virus

174. Disinfection that kills the microorganism _______________ will also destroy hepatitis B and the HIV virus.

175. A ____________________ seals the dentinal tubules.

(a) base
(b) liner
(c) cavity varnish

176. A ___________________ should not be placed under restorative resins.

(a) base
(b) liner
(c) varnish cavity

177. People who have HIV infection are ____________________.

(a) considered infectious when an opportunistic infection is present.
(b) not infectious until signs and symptoms of the disease are present.
(c) infectious
(d) not infectious

178. The dentin has many canals which lead to the pulp. These canals are called ____________________.

(a) pulp canals
(b) pulp chambers
(c) dentinal tubules
(d) pulp tubules

179. Calculus is removed from the tooth surface by a process known as ________________.

(a) polishing
(b) scaling
(d) hand polishing
(e) selective scaling

180. Liners containing __________________ promote secondary dentin formation.

(a) copalite
(b) zinc oxide-eugenol
(c) fluoride
(d) calcium hydroxide

181. Some cements may be used as __________________.

(a) a cavity varnish
(b) a base or liner
(c) a cavity varnish, base or liner

182. The use of gloves, masks, and eyewear provide an effective barrier in preventing the transmission of ________________.

(a) the AIDS virus
(b) the hepatitis B virus
(c) herpes simplex I
(d) a and b
(e) a and c
(f) all of the above

183. The HBV can be transmitted through ___________________.

(a) blood
(b) saliva
(c) semen and other bodily secretions
(f) a and b
(g) b and c
(h) all of the above

184. When a zinc phosphate cement base is used, ______________ should be placed first.

(a) calcium hydroxide
(b) cavity varnish
(c) zinc oxide eugenol
(d) a and b
(e) a and c
(f) b and c
(g) all of the above

185. A _________________ is a colloid in which the medium is water.

(a) gel
(b) sol
(c) hydrocolloid

186. Alginate is a(an) ____________________ hydrocolloid.

(a) reversible
(b) irreversible

187. Agar-agar is a (an) _______________ hydrocolloid.

(a) reversible
(b) irreversible

188. ____________________ impression material has a strong odor and will stain clothing.

(a) Silicone
(b) Polyether
(c) Polysulfide

189. When replacing the protective cap on the dental needle, ___________________.

(a) the two handed technique should be used
(b) the scoop technique should be used
(c) the needle should be bent first
(d) the protective cap should not be replaced prior to disposing of the needle

190. The function of a luting cement ______________________.

(a) is to seal the dentinal tubules
(b) is to provide retention between the tooth surface and the restoration surface
(c) is to provide a barrier between the pulp and the restoration
(d) is to provide additional strength to the restoration

191. A major advantage of using Glass ionomer cement is the __________________.

(a) slow release of fluoride onto the tooth structure
(b) sedative properties of the cement on the pulp
(c) ability of the cement to flow into surface irregularities of the tooth

192. When placing a base in a deep restoration, the cement of choice would be _________________.

(a) Glass ionomer
(b) zinc phosphate
(c) resin
(d) zinc oxide-eugenol

193. Which cement adheres to the enamel and dentin of the tooth?

(a) zinc phosphate
(b) Glass ionomer
(c) zinc oxide-eugenol
(d) resin

194. Resins are used in dentistry for _________________________.

(a) restorative materials
(b) temporary coverage for a tooth
(c) the fabrication of dentures
(d) a and b
(e) a and c
(f) all of the above

195. A/an ________________ denotes a molecule that is made up of many monomers.

(a) polymer
(b) ionomer
(c) ion

196. __________________ is a form of Periodontal Disease.

(a) gingivitis
(b) periodontitis
(c) pulpitis
(d) a and b
(e) a and c
(f) all of the above

197. Composite resins are a _______________________.

(a) tooth-colored restorative material designed for use in the anterior teeth
(b) tooth-colored restorative material designed for use in the posterior teeth
(c) tooth-colored restorative material designed for use in the anterior and posterior teeth

198. Acid etch can be applied as a __________________.

(a) gel
(b) liquid
(c) paste
(d) a and b
(e) a and c
(f) b and c
(g) all of the above

199. Acid etch should be ___________ on the tooth surface.

(a) dabbed
(b) rubbed
(c) burnished

200. Composite resins may be _______________ to the pulp.

(a) soothing
(b) irritating

201. The ______________ composite material is more resistant to abrasion and difficult to polish, when compared to other types of composite material.

(a) hybrid
(b) macrofilled
(c) microfine

202. A _____________ is a layer of tooth-colored restoration that is attached to the surface of a prepared tooth or teeth.

(a) composite
(b) veneer

203. _____________ means the image will appear opaque or light in color on the x-ray.

(a) Radiopaque
(b) Radiolucent
(c) none of the above

204. _________________ will increase the hardness as well as the strength of a gypsum product.

(a) increasing the water/powder ratio
(b) decreasing the density of the plaster or stone
(c) excluding air from the mix
(d) incorporating air into the mix

TRUE OR FALSE. MARK A T FOR TRUE OR AN F FOR FALSE ON THE ANSWER SHEET PROVIDED.

____ 205. Luting cements can be applied as a permanent or temporary cement.

____ 206. Heat is produced when zinc phosphate powder and liquid are mixed together.

____ 207. Bone loss is present in periodontitis.

____ 208. Polymerization is also referred to as curing.

____ 209. An immunization is now available for the AIDS virus.

____ 210. Persistent generalized lymphadenopathy is a symptom of Hepatitis B.

____ 211. One common site for oral candidiasis is the buccal mucosa.

____ 212. Disinfecting agents may cause deterioration of the glove material.

____ 213. Infection control procedures should not be the same for every patient.

____ 214. Sterilization of handpieces is not recommended.

____ 215. A surface does not have to be cleaned prior to using a disinfecting agent.

____ 216. Phenolics may be used to disinfect handpieces.

____ 217. Hybrid composite material combines the macrofilled and microfilled particle sizes.

WHEN YOU HAVE COMPLETED THE EXAMINATION, RETURN THE EXAMINATION AND YOUR ANSWER SHEET TO THE EVALUATOR.

ANSWER KEY

FINAL EXAMINATION

Fundamentals for Dental Assisting

1. (e)
2. (a)
3. (a)
4. (c)
5. (c)
6. (a)
7. (a)
8. (c)
9. (d)
10. (c)
11. (d)
12. (b)
13. (a)
14. (c)
15. (f)
16. (a)
17. OCCLUSION
18. TRUE
19. FALSE
20. FALSE
21. (a)
22. (d)
23. (e)
24. (c)
25. (a)
26. (c)
27. (d)
28. (b)
29. (a)
30. (a)
31. (b)
32. (a)
33. (d)
34. (a)
35. (a)
36. (c)
37. (b)
38. (b)
39. (d)
40. (c)
41. (b)
42. (d)
43. (c)
44. (f)
45. (b)
46. (a)
47. (b)
48. (d)
49. (d)
50. (e)

51. (c)
52. (a)
53. (a)
54. (b)
55. LINE ANGLE
56. (d)
57. (b)
58. (b)
59. POINT ANGLE
60. TRUE
61. FALSE
62. FALSE
63. TRUE
64. TRUE
65. (d)
66. (c)
67. (a)
68. (f)
69. (d)
70. (g)
71. (b)
72. (b)
73. (c)
74. (d)
75. (e)
76. (b)
77. (f)
78. PLAQUE
79. INTERDENTAL PAPILLA
80. DENTIN
81. (d)
82. (d)
83. (a)
84. (a)
85. (b)
86. (a)
87. (b)
88. (b)
89. (d)
90. (a)
91. (b)
92. (b)
93. (b)
94. (c)
95. (b)
96. (c)
97. (c)
98. (b)
99. (b)
100. (d)
101. (d)
102. (c)
103. (b)
104. (d)
105. (a)
106. (a)
107. (c)
108. (a)
109. (a)
110. (c)
111. (a)
112. (b)
113. (b)
114. (c)
115. (d)
116. (a)
117. (b)
118. (d)
119. (b)

120. (c)
121. (a)
122. (e)
123. (b)
124. (f)
125. (a)
126. (a)
127. LEGALLY COMPETENT
128. A LAWFUL ACT
129. CONSIDERATION
130. SKILL, CARE & JUDGEMENT
131. (e)
132. (d)
133. (a)
134. (f)
135. (c)
136. LEGAL DUTY
137. BREACHED
138. HARM OR INJURY
139. PROXIMATELY
140. (a)
141. MALIGNING A PATIENT
142. PERMITTING A HAZARD IN THE DENTAL OFFICE
143. BREACH OF CONTRACT
144. TECHNICAL ASSAULT
145. MALPRACTICE
146. (e)
147. (c)
148. (d)
149. (b)
150. LEGALLY COMPETENT
151. INFORMED
152. TREATMENT
153. A LEGAL ONE
154. FRAUD (DECEIT OR TRICKERY AND FRAUT ARE OK)
155. (c)
156. (a)
157. (d)
158. (e)
159. (a)
160. REGISTERED MAIL
161. SIX
162. LETTER OF TRANSMITTAL (OR LETTER ACCOMPANYING THE RECORDS)
163. (a)
164. (e)
165. (b)
166. (b)
167. (b)
168. (a)
169. (c)
170. (c)
171. (c)
172. (c)
173. (b)
174. MYCROBACTERIUM TUBERCULOSIS VAR BOVIS
175. (c)
176. (c)
177. (c)
178. (c)
179. (b)
180. (d)
181. (b)
182. (d)
183. (f)
184. (d)
185. (c)
186. (b)
187. (a)
188. (c)
189. (b)
190. (b)
191. (a)
192. (d)
193. (b)
194. (f)
195. (a)
196. (d)
197. (c)
198. (d)
199. (a)
200. (b)
201. (b)
202. (b)
203. (a)
204. (c)
205. TRUE
206. TRUE
207. TRUE
208. TRUE
209. FALSE
210. FALSE
211. TRUE
212. TRUE
213. FALSE
214. FALSE
215. FALSE
216. TRUE
217. TRUE

ACKNOWLEDGEMENTS

The author is grateful to the following people for their contributions to this module.

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Module 1-C

FUNDAMENTALS FOR DENTAL ASSISTING

Supplemental Module

IDAHO VOCATIONAL EDUCATIONAL SUPPLEMENTAL MODULE

FOR

"FUNDAMENTALS FOR DENTAL ASSISTING"

FUNDAMENTALS I AND II

Developed by

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FUNDAMENTALS FOR DENTAL ASSISTING

COURSE OUTLINE

CLOCK HOURS

Theory/Classroom Lecture	36 hours
Self-Study Course	36 hours
Written Examination	2.5 hours

COURSE DESCRIPTION

Fundamentals for Dental Assisting is designed as an introductory course for individuals interested in pursuing a career in dental assisting. This course provides basic background knowledge essential for employment in a dental office.

The method of study may be offered through lecture and classroom demonstrations, or self-study texts and supplemental modules. Since this course provides limited dental knowledge, it is strongly recommended that individuals seek additional experience in a dental office to help maximize learning.

Upon completion of the classroom or self-study course, a minimum score of 80% on the final examination must be achieved to receive a certificate of completion in Fundamentals for Dental Assisting. Fundamentals for Dental Assisting is a prerequisite for any of the six Expanded Functions Dental Assisting Courses.

Employment in a dental office is not a prerequisite for Fundamentals for Dental Assisting (either the lecture or self-study course). An individual is eligible to challenge the Fundamentals For Dental Assisting final examination, at any time. Previous dental experience or employment in a dental office is not a requirement prior to taking the examination.

REQUIRED TEXTS

A. Colwell Systems Inc. Instructional Materials

I. Fundamentals I, "Introduction to Dental Terminology, Charting and Cavity Classification."

II. Fundamentals II, "Infection Control, Local Anesthesia, and Oral Surgery."

III. Fundamentals For Dental Auxiliaries, "Ethics and Jurisprudence."

B. Idaho Vocational Educational Supplemental Modules

I. Idaho Vocational Education Supplement to Colwell Self-Instructional Module, Fundamentals I, "Introduction to Dental Terminology, Charting and Cavity Classification".

II. Idaho Vocational Education Supplement to Colwell Self-Instructional Module, Fundamentals II, "Infection Control, Local Anesthesia, and Oral Surgery."

III. "Introduction to Dental Materials," a self-study module developed by Kelly Reich, RDH, BA.

COURSE REQUIREMENTS FOR LECTURE COURSE

1. Attend all lecture and classroom demonstrations

2. Complete all assigned readings in the Colwell Self-Instructional Module, as well as the Vocational Educational Supplemental Modules. The Supplemental Modules are designed to be used in conjunction with the required Self-Instructional Modules and will often refer back to the required modules. Additional information has also been provided in the Supplemental Modules, so it is important to comprehend this information as well.

   The final examination will cover material from the Colwell Self-Instructional Modules and the Vocational Education Supplemental Modules.

3. Complete all chapter exercises in the Colwell Self-Instructional Modules and any additional exercises in the Vocational Educational Supplemental Modules.

4. Achieve a minimum score of 80% on the final examination.

COURSE REQUIREMENTS FOR SELF-STUDY COURSE

1. Read, in succession, all required Colwell Self-Instructional Modules and Vocational Educational Supplemental Modules. The Supplemental Modules are designed to be used in conjunction with the required Self-Instructional Modules, and will often refer back to these required modules. Additional information

has been provided in the Supplemental Modules, so it is important to comprehend this information as well.

The final examination will cover material from the Colwell Self-Instructional Modules and Vocational Educational Supplemental Modules.

2. Complete all chapter exercises in the Colwell Self-Instructional Modules and any additional exercises in the Vocational Educational Supplemental Modules.
3. Achieve a minimum score of 80% on the final examination.

NOTE: It is suggested that the average student will complete the Self-Study course in approximately 45 hours. Due to variations in learning styles, it is anticipated that some individuals will achieve this goal in less time and other students may need additional time.

EVALUATION/GRADING

This course is designed on a Pass/Fail basis. In order to successfully complete the course, the student must follow the course requirements for either the Self-Study or Lecture course and achieve a minimum score of 80% on the final examination.

SECTION I.

SUPPLEMENTAL MODULE FOR

FUNDAMENTALS I

"INTRODUCTION TO DENTAL TERMINOLOGY, DENTAL CHARTING, AND CAVITY CLASSIFICATION"

INTRODUCTION

This Vocational Education Supplemental Module (referred to as the Supplemental Module), has been designed to be used in conjunction with the Colwell Systems Inc. Self-Instructional Module Fundamentals I, "Introduction to Dental Terminology, Charting and Cavity Classification." It is important to follow each Colwell Self-Instructional Module in succession.

The Supplemental Module will be used to help enhance learning, and provide the student with additional information on the subject area.

All reading assignments and the amount of time required for each subject area will also be listed in the Supplemental Module. The information in the Supplemental Module will correspond to the reading material in the Colwell Self-Instructional Module.

1. Follow the instructions in the Supplemental Module before beginning the Colwell Self-Instructional Module.

2. Review the instructional objectives in the Colwell Self-Instructional Module.

3. Complete the chapter exercises in the Colwell Self-Instructional Module as the reading assignments are completed.

4. Refer to the Glossary to use while reading if terminology is unfamiliar.

INSTRUCTIONS FOR COMPLETING THE IDAHO VOCATIONAL EDUCATION SUPPLEMENTAL MODULE FOR FUNDAMENTALS I, "DENTAL TERMINOLOGY, CHARTING AND CAVITY CLASSIFICATION"

INSTRUCTIONS

1. Read the Instructional Goals in the Colwell Self-Instructional Module Fundamentals I.

2. Follow all the reading assignments listed on the following pages. The additional dental terminology in the Supplemental Module will correspond to the reading material in the Colwell Self-Instructional Module, Fundamentals I.

3. Read Chapter 1 in the Colwell Self-Instructional Module, and complete the Chapter 1 exercises. Read the following dental terminology.

PERIODONTAL DISEASE

Periodontitis is a form of Periodontal Disease. Periodontitis affects the alveolar bone and other supporting structures of the teeth. If the disease is not treated, it may result in tooth loss.

Periodontal pockets are present with periodontitis because the alveolar bone has been destroyed causing the sulcus to become deeper. Once bone has been destroyed, the support of the tooth is permanently lost.

Periodontitis can be successfully treated. Success of treatment depends upon early detection and frequent recalls for maintenance therapy.

Daily homecare (e.g., brushing, flossing, etc.) will remove the plaque that accumulates on the teeth. Plaque will also accumulate on calculus because it is a porous surface.

Calculus cannot be removed by patient homecare regimes. These hard deposits are removed by hand instruments (e.g., curets, scalers, etc.). A dentist or dental hygienist is licensed to remove hard deposits from the teeth. The procedure by which calculus is removed from the teeth is referred to as scaling and/or root planing.

TISSUES OF THE TEETH

The dentin has many tiny canals which lead to the pulp. These canals are called Dentinal Tubules. When a tooth is prepared (drilled), tooth structure is removed and the dentinal tubules are exposed. When a dental material is placed on the dentin, it is important to first protect the pulp by placing a material over the dentin that will act as a barrier between the dental material and the pulp. If the dentinal tubules are protected, the irritants cannot reach the pulp.

INSTRUCTIONS

Read Chapter 2, 3 and 4 in the Colwell Self-Instructional Module, and complete the Chapter 2, 3 and 4 exercises. Read the following dental terminology.

DECAY

A prepared tooth means the decayed or damaged tooth structure has been removed by the dentist and the tooth has been prepared for retention of a restorative material. A temporary or permanent restorative material is then placed in the cavity preparation.

If the decay has extended into the dentin and involves a large portion of the tooth, a significant amount of dentin may be lost. Materials are available which are placed on the dentin to promote the formation of new dentin. This new dentin is referred to as secondary dentin formation and aids in repairing the tooth structure.

Various types of restorative materials may be used to fill a cavity preparation after the decay has been removed. For example, dental cements may be used as a temporary filling material. A tooth-colored restoration, for example a composite, may be placed in either the anterior or posterior teeth. Amalgam, (silver filling material) is another commonly used restorative material.

PIT AND FISSURE SEALANTS

The dental material that is used in sealing pits and fissures on the occlusal surfaces of the teeth is similar to the composite material placed in anterior and posterior restorations. The material may be clear or tinted, and will harden (set) by a chemical reaction or with the use of a light source.

ACID ETCH

In order for the sealant material to adhere to the tooth structure, a liquid or gel is first placed on the enamel. The liquid or gel is an acid that etches (makes the surface more porous) the enamel and enables the sealant material to flow into the surface irregularities of the tooth. Acid etch also is used before composite restorations are placed.

BASE AND CATALYST

The two components of the sealant are mixed together. One of the components is referred to as a Base and the other component is referred to as the Catalyst (sometimes called the initiator or reactor depending on the material). The catalyst initiates the reaction. Without the catalyst a reaction would not occur. Many materials in dentistry are mixed together as a base and a catalyst.

MONOMERS AND POLYMERS

Monomers are single molecules. When many of these molecules join together, they form Polymers, a higher molecular mass. Hair is a naturally-occurring polymer. Rayon and rubber are synthetic (man-made) polymers.

Monomers and Polymers are mixed together to bring about a desired result. When these types of components are mixed together, the outcome is usually much different than the original state of the materials. Examples of polymers used in dentistry include rubber base impression materials and sealant materials.

Read Chapter 5, 6 and 7 in the Colwell Self-Instructional Module, and complete the Chapter 5, 6 and 7 exercises. Read the following dental terminology.

OCCLUSION

It is important to check the patient's occlusion after restorative work has been completed. If the patient is not biting correctly on all the teeth, trauma may result. The tooth or teeth surfaces may be high, causing the patient to occlude (bite) incorrectly. This causes additional stress on the periodontal ligament, and sensitivity or tenderness may occur when biting.

INSTRUCTIONS

1. Complete the remaining Chapters 8 through 11, in the Colwell Self-Instructional Module, and complete the remaining Chapter exercises.

2. Review the Chapter 12 Glossary. For additional terminology, read the following section in this Supplemental Module. This terminology will be important to understanding the material in Fundamentals I and II, and the Dental Materials Module.

DENTAL TERMINOLOGY

The following dental terminology should be used in conjunction with the Chapter 12 Glossary in the Colwell Self-Instructional Module. The definitions pertain to information covered in the Supplemental Modules for Fundamentals I and II, and Dental Materials.

Adhesion - Two unlike molecules are attached by a force. The force may be chemical, mechanical or both.

Antiseptic - A substance which inhibits or kills bacteria.

Cast - Duplication or replica of the teeth or dental area.

Casting - The product which is obtained as a result of filling a mold with molten metal.

Colloid - A suspension of particles in a medium, such as water, which consists of two or more phases. Colloid is used to describe a state of matter.

Composite - A tooth-colored resin material used for restorative purposes.

Coronal Polishing - A procedure by which plaque and extrinsic stain is removed from the teeth. All calculus must be removed from the teeth prior to polishing.

Curing - The process of polymerization.

Dental Auxiliary - Personnel employed by the dentist. When referring to dental procedures, the dental auxiliary involved are usually the dental assistant(s) and dental hygienist(s).

Disinfectant - An agent or chemical used to kill harmful microorganisms.

Extrinsic Stain - Stain that appears on the surface of the tooth and can be removed by polishing. The stain may vary in color.

Gel - The solid phase of a colloid.

Hydrocolloid - A colloidal solution in which water is used as a dispensing medium.

Monomer - A substance composed of single molecules.

Polymer - When many monomers join together they form a polymer, or a chain of polymers.

Radiolucent - Freely penetrable by x-rays. The image on the x-ray will appear dark gray to black.

SOL - Colloidal particles dispersing in a liquid.

Synthetic Resin - A man-made material which has plastic characteristics. It can be molded into various forms and then hardened. Resins are used in dentistry for orthodontic appliances, restorative materials, temporary coverage, custom impression trays, and cements.

Systemic - Relating to a system or entire bodily system.

SECTION II.

SUPPLEMENTAL MODULE FOR

FUNDAMENTALS II
"INFECTION CONTROL, LOCAL ANESTHESIA, AND ORAL SURGERY"

INTRODUCTION

This Vocational Education Supplemental Module (referred to as the Supplemental Module), has been designed to be used in conjunction with the Colwell Systems Inc. Self-Instructional Module Fundamentals II, "Infection Control, Local Anesthesia, and Oral Surgery."

It is important to follow each Self-Instructional Module in succession. This module will be used to help enhance learning, and provide the student with additional information not covered in the Colwell Self-Instructional Module.

Learning styles may vary with each individual. The amount of time projected for completion of Fundamentals II, is only a guideline. Some may exceed this limit, while others may complete the material within a shorter time period.

It is important to have an understanding of all the information and to successfully complete all exercises in Fundamentals II.

Study questions are included in this module, and will cover information from the Self-Instructional and Supplemental Module.

Additional references have been provided to give the student a broader knowledge of infection control, hepatitis B, and HIV infection.

INSTRUCTIONAL GOALS

The following instructional goals are continuous with the instructional goals for Disease Transmission and Infection Control in the Colwell Self-Instructional Module Fundamentals II. Read the instructional goals in the Colwell Self-Instructional Module and then read the instructional goals listed below.

DISEASE TRANSMISSION

4. Explain why it is important to update a patient's medical history.

5. Describe how cross-contamination may be reduced during a dental procedure.

6. List the four types of Hepatitis.

7. Describe how Herpes Simplex I may be transmitted in a dental setting.

8. State the routes of disease transmission for Hepatitis B.

9. Discuss the differences and similarities between HIV infection and AIDS.

10. Describe the signs and symptoms of HIV infection.

11. State which type of people are at high risk for contracting AIDS.

12. List two oral manifestations of AIDS.

INFECTION CONTROL

10. Explain why handwashing is important after removing gloves.

11. List four infection control procedures used during pre-treatment.

12. List two types of surface disinfectants.

13. Describe why a surface must be cleaned prior to using a surface disinfectant.

14. Discuss the importance of the Microorganism, Mycobacterium Tuberculosis var. Bovis in dentistry.

15. List three types of chemical agents.

16. State four uses for chemical agents in dentistry.

17. Describe why it is important to follow the manufacturer's directions when using chemical agents.

INFECTION CONTROL

INSTRUCTIONS

Read Chapter 1 in the Colwell Self-Instructional Module Fundamentals II and complete the Chapter exercises. After completing Chapter 1, read the following information on Disease Transmission.

DISEASE TRANSMISSION

Personal Contact

The area around the mouth, as well as the oral mucosa should routinely be checked before a dental procedure is begun. This examination may alert the dental auxiliary to any sores (lesions) which may be present during the examination.

It may be necessary to re-appoint a patient if lesions are found around the mouth, or in the oral cavity. The potential of disease transmission is present, and the person may reinfect another area of the mouth if dental work is done. If a lesion is found, it is important to check with the dentist before any dental procedure is begun.

Carrier Contact

The medical history of each patient should be routinely updated at each appointment. A thorough medical history is important because it may alert the dental auxiliary to possible infectious diseases. Unfortunately, a person may not be aware they have an infectious disease.

Medical consultation may be necessary when the patient has had a history of active infection, or a systemic disease has been noted in the medical history.

Each patient must be considered potentially infectious, and the same infection control procedures should be used for ALL patients.

Droplet Infection

Much of the mist that comes from a high-speed handpiece is not noticeable. It dries on the skin, clothing, and other surfaces as a clear film. It is important to remember that the aerosols or splatter produced by a high-speed handpiece, ultrasonic handpiece, or air-water syringe contain potentially dangerous microorganisms.

Indirect Transmission

Infection control procedures recommended by the American Dental Association and the Centers for Disease Control should be adopted by all dental offices. It is everyone's ethical and legal responsibility to ensure that the infection control guidelines are followed.

All items that come in direct contact with the oral cavity, and soft and hard tissue, should be handled with caution. Items and materials used during the dental procedure should remain in one area to prevent cross-contamination. Once an item or area is contaminated, microorganisms can be carried from that area to another person.

Place items that cannot be sterilized in an area away from contaminated objects or surfaces. If a non-contaminated object must be touched, cover it with some type of barrier before touching the surface.

Remember, gloves used during patient care are contaminated. Any surface that is touched by these gloves (e.g., switches, pencils, telephone, dental charts, and eyewear) will be contaminated. If it becomes necessary to leave the operatory, dispose of gloves and mask, and wash hands with an antiseptic soap.

The dental procedure should be well organized, and materials should be available before seating the patient. Stop and Think! This will eliminate unnecessary movement to other areas and prevent cross contamination.

Herpes

Herpes Simplex I can cause recurrent infections on the mouth, face, and fingers. The virus may remain active from two days to two weeks. The virus may be transmitted if broken skin touches an area where blisters or ulcerations are present.

If the patient has an area where lesions are present, dental personnel may reinfect the patient in another area in or around the mouth. Also, touching the lesion, the virus may then be transmitted to other individuals if infection control procedures are not followed.

The Herpes Simplex virus can survive on surfaces and hands for many hours.

Hepatitis

Four types of Hepatitis are known: hepatitis A, hepatitis B, non-A, non-B hepatitis, and delta hepatitis.

Hepatitis B

The hepatitis B virus (HBV) is more resilient than the AIDS virus, HBV is a hardy virus that is able to live on surfaces for weeks at a time. Hands should be thoroughly washed before and after gloves are worn. Microorganisms are also capable of surviving under fingernails if the hands have not been properly cleansed.

The majority of people who are HBV carriers are unaware of ever having the disease, or they may have contracted the virus as a carrier without ever experiencing the disease itself. These individuals can transmit the HBV virus through saliva, blood, semen, and other secretions. Persons who become carriers may be infectious for the rest of their life.

The use of gloves, mask, and protective eyewear should be a routine practice with every patient. The use of masks, gloves, and eyewear provide an effective barrier in preventing the transmission of the hepatitis B virus. Sterilization procedures should also be followed to decrease risk of transmission.

The Centers for Disease Control recommend that health care workers who are at risk for HBV, have the hepatitis B vaccine.

A blood test may be taken prior to the immunization, to determine if antibodies are present. If the level is high enough, immunization may not be necessary.

The immunization is given in a series of three injections. The initial injections are given at one month intervals. The last injection is administered 6 months after the first injection.

Minor side effects have appeared in a small percentage of the population who have had the vaccine.

HIV Infection and AIDS

The virus suppresses the immune system, so the body is more susceptible to infections and disease.

The term HIV positive or HIV infection means that the human immunodeficiency virus is present in the blood. It may also be present in other body fluids. People who have HIV infection, are INFECTIOUS and may have no symptoms of the disease. However, the virus can be transmitted even though the patient has no symptoms of the disease.

After a period of time, sometimes longer than seven years, individuals may begin to develop symptoms. These symptoms are present in the later stages of HIV infection or AIDS.

Signs and symptoms of HIV infection are flu-like. Symptoms may include: persistent generalized lymphadenopathy (swollen and tender lymph modes), unexplained weight loss, fatigue, diarrhea lasting for more than one month, fever for more than one month, or a combination of these symptoms.

A person is said to have AIDS when an opportunistic infection, such as pneumonia or cancer, is diagnosed. People who have AIDS still have HIV infection, because it is the human immunodeficiency virus that causes the disease.

When treating patients who are in the advanced stages of AIDS, the dental personnel are also at risk of exposure to secondary infectious agents such as hepatitis B, and Herpes Simplex.

High Risk Groups

Homosexuals, hemophiliacs, past or present intravenous (IV) drug users, heterosexuals with multiple sexual partners, and individuals who have received blood transfusions are at risk of contracting the AIDS virus. Some groups are at higher risk than others. Dental personnel are at risk due to the exposure to blood/body fluids during the dental procedure.

Oral Conditions

Conditions associated with HIV infection may be seen in the oral cavity. The herpes simplex virus infection may cause ulcers that persist for longer than a month. Another oral manifestation of HIV infection is hairy leukoplakia. This is a hairy looking white plaque found on the lateral border of the tongue. It may eventually spread to the dorsal surface of the tongue, and also appear on the palate and buccal mucosa. The gingival tissue and bone structure are affected with HIV infection.

Although not included among the diagnostic criteria for AIDS, oral candidiasis (thrush) is frequently seen in individuals who are HIV positive.

Four major types of oral candidiasis have been recognized. The specific types will not be covered in great detail, but a brief description of the clinical signs of oral candidiasis will be mentioned. Oral candidiasis may appear as a creamy white or yellowish plaques on any part of the oral mucosa, and may be scraped off to reveal a bleeding surface. Another type of oral candidiasis is characterized by white plaques, and cannot be removed by scraping.

Oral candidiasis may also appear as a fiery red spot or a small pink spot. The color intensity of the lesion may also vary.

Various areas of the mouth may be affected by oral candidiasis. Depending upon the type of candidiasis, the location of the lesion(s) may vary. Common sites for candidiasis are the palate, tongue, buccal mucosa, and the area around the mouth.

Other oral manifestations can be present with HIV infection, in addition to the conditions listed.

Ethical Considerations

The American Dental Association believes, as stated in its policy on AIDS, that HIV-infected individuals should be treated with compassion and dignity. Current scientific and epidemiologic evidence indicates that there is little risk of transmission of infectious diseases through dental treatment if recommended infection control procedures are routinely followed. Such infection control procedures provide protection for patients and dental personnel.(1)

For information on AIDS as it relates to dentistry, chemical disinfecting/sterilizing agents and barrier techniques call the ADA Council on Dental Therapeutics (312) 440-2528.

American Dental Association
Division of Scientific Affairs
Council on Dental Therapeutics
211 East Chicago Avenue
Chicago, IL 60611

Additional references have been listed at the end of this supplemental module to help the student gain a better understanding of infectious diseases and infection control procedures.

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(1) American Dental Association Council on Dental Therapeutics, "Facts About AIDS for the Dental Team," October 1988.

INSTRUCTIONS

Read Chapter 2 in the Colwell Self-Instructional Module Fundamentals II and complete the chapter exercises. After completing Chapter 2, read the following information.

INFECTION CONTROL

Gloves

Hands should be washed prior to placing gloves on. Gloves should be inspected for puncture holes or tears before being placed on the hands.

Use a handwashing agent that contains an antiseptic agent. This will help kill many organisms that are not removed by handwashing.

Hands should always be washed after removing gloves for numerous reasons. Small holes or tears may result during treatment, disinfecting agents may cause deterioration of the glove material, and organisms on the hands can multiply in the moist environment of gloved hands.

Handwashing

Fingernail polish or false fingernails should be avoided when working in a dental setting. Microorganisms can multiply on these surfaces and may not be removed by handwashing.

Disposable towels should be used for drying hands.

Masks

The following rules are in conjunction with the Basic Rules for a Mask, as listed in the Colwell Self-Instructional Module.

3. Adjust the mask so it fits snugly against the face.
4. Remove it as soon as treatment is completed. Do not leave the operatory with your mask.
5. When removing the mask, handle it by the cloth strings, or elastic handles. Try to never touch the mask itself.

Infection Control During Pre-treatment

Look around the operatory. Remove unnecessary items that will not be used during treatment. Keeping the operatory uncluttered will reduce the number of items that can become contaminated.

Run handpiece and air-water syringes for at least three minutes each morning to flush out lines.

Organize and set out all dental materials, instruments, x-rays, and items before the patient is seated. Planning ahead minimizes the need to enter drawers or cabinets during the dental procedure and reduces the risk of contamination.

The use of pre-arranged tray set-ups can also eliminate the need to enter drawers during the dental procedures.

Use disposable items (items that are used once and then thrown away) as much as possible. The use of disposables can eliminate the problem of decontaminating hard-to-clean items.

Identify the items and objects that will be contaminated during the procedure. Use barrier techniques on the equipment and surfaces that will be contaminated. Try to keep all contaminated items in one area. Place all items that cannot be sterilized away from the contaminated area.

Each office will be unique in its infection control procedures. Barriers placed on the dental equipment and dental unit may be expensive. Disinfectants are less expensive, but can stain and corrode some materials. It is the personal choice of the dentist and dental auxiliary to decide what type of infection control measures will be used.

Dental personnel should be well informed about aseptic techniques, and the ADA guidelines that have been established for infection control. Infection control procedures must be used on every patient and incorporated into the office as part of the routine dental procedure.

Patient Treatment

During patient treatment, precautions should be taken by the assistant when passing or receiving sharp instruments. Sharp edges should be kept away from the assistant and the operator. Dispose of all sharp items as soon as possible. Do not leave uncapped needles on instrument trays.

Protective eyewear, gloves and masks must be worn during the dental procedure.

OPERATORY CLEAN-UP

INSTRUCTIONS

Read Chapter 3 in the Colwell Self-Instructional Module Fundamentals II and complete the chapter exercises. After completing Chapter 3, read the following information.

INFECTION CONTROL DURING POST-TREATMENT

All surfaces not protected by barriers must be cleaned first, and then disinfected with a surface disinfectant, such as iodophor, phenolic solution, or diluted household bleach.

Sterilization of handpieces is recommended. Some handpieces cannot be sterilized. If a handpiece cannot be sterilized, disinfect it with an EPA registered hospital disinfectant that is tuberculocidal. Some disinfectant chemicals may damage a handpiece. Always read and follow manufacturer's directions.

Disinfection

A surface should be cleaned prior to disinfecting or sterilizing. Cleaning the surface first reduces the amount of microorganisms and removes blood and debris which may cause the chemical agent to be less effective.

Microorganisms will vary in their resistance to chemical agents. An endospore is a very resistant type of bacteria. The term sporicidal means the product is capable of destroying bacterial spores.

The microorganism MYCOBACTERIUM TUBERCULOSIS var. BOVIS, is used in laboratories to test the killing power of chemical agents. This is a very resistant type of bacteria, and is a relative of the bacterium that causes tuberculosis. If an agent is capable of destroying Mycobacterium Tuberculosis var. Bovis, it is also capable of destroying less resistant microorganisms.

Disinfection that kills Mycobacterium Tuberculosis var. Bovis will also destroy Hepatitis B and the HIV virus. It may not be capable of killing bacterial spores.

Some chemical agents will destroy all bacteria, fungi and some viruses. These low-level disinfectants (which are effective, but not as potent) will not destroy bacterial spores, or Mycobacterium Tuberculosis var. Bovis.

It is essential that dental personnel read all labels and manufacturer's directions before using a chemical agent.

The label will identify what microorganisms the chemical agent will destroy, and specific directions for its use. Attention should be given to the shelf life and activated use life of these products.

Some disinfectants are harmful to skin and eyes, so caution should be used with all chemical agents.

Liquid Chemical Agents

The Environmental Protection Agency is a governmental agency that registers chemicals as either disinfectants or sterilants (capable of sterilizing).

The product must have an EPA number on the label, and must be registered by the EPA.

Products which have the American Dental Association seal of acceptance have been accepted by the Council of Dental Therapeutics for use in dentistry.

Glutaraldehydes

Glutaraldehydes are used as disinfectants or sterilants.

Proper ventilation is important when using glutaraldehyde. The fumes are toxic and the agent can irritate the eyes and skin.

Follow label directions carefully for each type of glutaraldehyde production.

Iodophors

Iodophors are used as disinfectants on surfaces and some dental equipment. Countertops, drawers,and dental units, etc., must be cleaned prior to using Iodophors.

Iodophors contain iodine, and may stain certain dental items. Repeated use of Iodophor on metal instruments will corrode the metal.

Sodium Hypochlorite (Household Bleach)

Household bleach is used in a solution of 1/4 cup of bleach to 1 gallon of water. The solution should be mixed daily. Diluted solutions will lose their effectiveness.

The surface or item must be cleaned before using sodium hypochlorite.

Bleach should not be used on oxidizable metals or aluminum.

Phenolics

Phenolics are available as liquids or sprays. The spray is used for disinfecting equipment and surfaces. The diluted solution can be used for disinfecting prosthetic appliances.

Phenolics may also be used to disinfect handpieces.

Because each chemical agent has a specified use in dentistry, it is not safe to assume each product will perform the same. Always follow manufacturer's recommendations for use.

Infection Control for Laboratory Work

All impression material should be rinsed thoroughly under gentle running water. This will remove debris and blood from the impression material.

Gloves should be worn when handling any material that comes in contact with the oral cavity.

Gypsum casts may be sprayed with an iodophor disinfectant after the cast has been separated from the impression.

When possible, items should be disinfected before they are sent to the laboratory. This will prevent contamination of the laboratory and lab equipment.

Consult the manufacturer for disinfection recommendations for impression material.

INSTRUCTIONS

Read the remaining Chapters 6-8 in the Colwell Self-Instructional Module and complete the Chapter exercises. After completing Chapters 6-8, complete the Fundamentals II Post-Test.

Study questions have been included in this Supplemental Module to further test your knowledge on the topic of Infection Control. If a topic area was not clear, go back and review the information before completing the post-test or study questions.

FUNDAMENTALS II

INFECTION CONTROL STUDY QUESTIONS

1. Aerosol or splatter may be produced by ________________.

2. Why should a patient's medical history be routinely updated?

3. If a non-contaminated object must be touched during the dental procedure, what steps should be taken to prevent cross-contamination?

4. The Herpes Simplex virus may remain active for how many days?

5. The use of ___________, ____________, and _____________ provide an effective barrier in preventing the transmission of Hepatitis B and AIDS.

6. An immunization is available for the prevention of what infectious disease?

7. A person is said to have ____________ when an opportunistic infection is diagnosed.

   a. HIV infection
   b. AIDS
   c. Herpes Simplex

8. The letters, HIV mean what?

9. Symptoms may develop in the _______________ stages of HIV infection.

   a. early
   b. late

10. Name four (4) types of individuals who are at high risk for developing AIDS:

    1.______________
    2.______________
    3.______________
    4.______________

11. State two (2) oral manifestations associated with HIV infection.

    1.____________________
    2.____________________

12. What is hairy leukoplakia?

13. Handwashing agents should contain a(an) ____________ agent.

14. Why should a mask be discarded before leaving the operatory?

15. Handpieces and air-water syringes should be run for at least __________ minutes each morning.

    a. two
    b. three
    c. four

16. Name two chemical agents which may be used as surface disinfectants.

    1.________________
    2.________________

17. Why should a surface be cleaned prior to disinfecting?

18. What microorganism is used in laboratories to test the killing power of chemical agents?

19. Repeated use of ____________ on metal instruments will corrode the metal.

    a. Phenolics
    b. Iodophors
    c. All chemical agents

20. Sodium Hypochlorite is also known as __________________.

TRUE/FALSE

T F 1. Infection control procedures should be individualized for every patient.

T F 2. Once a lesion is present in the mouth, other areas of the oral mucosa cannot be infected.

T F 3. Medical consultation may be necessary when a systemic disease has been noted in a patient's medical history.

T F 4. Gloves should be washed with an antiseptic soap before being used on another patient.

T F 5. Herpes Simplex I cannot be transmitted by cross-contamination.

T F 6. The AIDS virus is more resilient than the Hepatitis B virus.

T F 7. The HBV virus cannot be transmitted through saliva.

T F 8. People who have HIV infection are not infectious.

T F 9. People who have AIDS do not have HIV infection.

T F 10. Oral candidiasis will always appear as creamy, white or yellowish plaques.

T F 11. False fingernails are acceptable to wear in a dental setting if gloves are used.

T F 12. ADA guidelines have been established for infection control procedures in the dental office.

T F 13. Sterilization of handpieces is not recommended.

T F 14. Disinfection that kills Mycobacterium Tuberculosis var. Bovis will not destroy the HIV virus.

T F 15. Chemical agents registered by the Environmental Protection Agency must have an EPA number on the label.

T F 16. Glutaraldehydes are used as disinfectants or sterilants.

T F 17. Low-level disinfectants will also destroy bacteria spores.

T F 18. Iodophors may stain certain dental items.

T F 19. Sodium hypochlorite should not be mixed daily when using it as a disinfectant.

T F 20. Impression material must not be disinfected if being sent to a laboratory.

BIBLIOGRAPHY

References

Fair, Joanna L., CDA, RDH, BS, Crawford, James, MA, Ph.D, Forbes, Eleanor A., BS, RDH. "AIDS: A New Concern in Dentistry," Dental Hygiene, November 1984.

"Facts About AIDS for the Dental Team," ADA Council on Dental Therapeutics, Second Edition, October 1988.

"Infection Control in the Dental Environment," (continuing education course). Washington, D.C., Department of Health and Human Services, 1988.

Molinari, John, Ph.D., and Merchant, Virginia A, DMD. "Viral Hepatitis--An Occupational Dental Disease," The Dental Assistant, March/April, 1984.

Maeman, Denise, RDH, MS. "Hepatitis: Types, Protection and Legal Ramifications," Seminars in Dental Hygiene, Volume 1, Number 1, May 1989.

Suggested Readings

"Infection Control Procedures and Products: Cautions and Common Sense," Judy Jakush, JADA, Vol. 117, August 1988.

"Infection Control Recommendations for the Dental Office and the Dental Laboratory," JADA, Vol. 116, February 1988.

Module 1-D

FUNDAMENTALS FOR DENTAL ASSISTING

Introduction to Dental Materials

INTRODUCTION TO DENTAL MATERIALS

SUPPLEMENTAL MODULE FOR
FUNDAMENTALS FOR DENTAL ASSISTING

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OBJECTIVES

After completing this dental materials module, the student should be able to:

1. Define the terms: metals, polymers, ceramics, and composites.
2. State the mechanical properties of dental materials and how each one relates to dentistry.
3. Explain the three types of force.
4. Explain the three types of stress and strain.
5. Describe the factors which may influence dental materials in the oral cavity.
6. State the requirements of a dental material that is used in the oral cavity.
7. Explain the purpose of impression materials used in dentistry.
8. Define Irreversible and reversible hydrocolloid, and provide an example of each.
9. List the three types of rubber impression material.
10. Explain the two techniques available for taking rubber base impressions.
11. State the purpose of a cavity varnish and liner.
12. Define the term luting cement.
13. List six uses for a dental cement.
14. List the five types of dental cements which may be used as luting agents.
15. Discuss the rationale for placing a base and cavity varnish in a preparation before using zinc phosphate cement.
16. List two cements which may be irritating to the pulp.
17. Explain the rationale for cleaning the cavity preparation before using polycaboxylate cement.
18. Discuss two advantages of using Glass ionomer cement.

19. List four common types of restorative materials.

20. Define the terms resin and synthetic resin.

21. Explain the term polymerization.

22. State three ways polymerization can occur in resin material.

23. Explain the composition of composite resins.

24. Explain the need for acid etch prior to placing a composite restoration.

25. State the classification of composite resins.

26. List four desired results of a finished composite.

27. Discuss additional uses for composite resins other than as a restorative material.

28. State three types of gypsum products.

SECTION 1.

INTRODUCTION AND BACKGROUND INFORMATION

INTRODUCTION

Introduction to Dental Materials has been designed to provide the student with basic background information about dental materials. The main goal of this module is to help the student have an understanding and knowledge of the materials available, and their uses in dentistry. Due to the vast amount of information available and the limitations of this course, it is strongly recommended that the student seek additional references to enhance their knowledge of dental materials.

Much of the desired results when using dental materials is dependent on the dental assistant's knowledge of the manipulation of the materials. The assistant should be able to recognize the materials which are placed in the patient's mouth, and understand their weaknesses and strengths. In order to gain a complete understanding of the manipulation and properties of dental materials, experience should be gained in a dental office.

BACKGROUND INFORMATION

The chemistry of a dental material, handling characteristics and the performance of the material are basic considerations when selecting a dental material.

The chemistry of a material describes its composition and the factors which allow it to be shaped or formed. The material may be placed in the mouth permanently like a restoration or crown, or it may be used during a procedure and then discarded.

All dental materials can be classified as: metals, polymers, composites, or ceramics.

I. CLASSIFICATION (TYPES) OF DENTAL MATERIALS

A. Metals

Most metals are not found in their natural state. Exceptions would be gold and platinum. Sometimes copper, mercury, and silver are found in a natural state. Most metals are combined with non-metals and must be refined and purified to release the metal.

Pure metals are very soft and can be bent and shaped easily. Many metals can be rolled to produce thin sheets. Some examples of metal used in dentistry are: aluminum (temporary crowns), lead (foil behind x-rays), and silver (endodontic points).

In most cases the metals are used because of the ease in which they can be manipulated. However, if additional strength is required, the metal must be combined with other metals or non-metallic elements.

B. Polymers

Natural polymers exist in the form of cellulose (wood pulp and cotton) and various other forms. Nucleic acid and collagen are polymers which are the structural building blocks of living things.

Polymers are also man-made and are used in dentistry. Some examples are acrylics, urethanes and silicones. These materials will be discussed later in the module.

C. Ceramics

Ceramics are either simple or complex, and a combination of metallic or non-metallic elements. They are hard and abrasive.

These materials have high melting points. The mixture of simple and complex ceramics, at high temperatures, form viscous liquids known as glasses and porcelains.

D. Composites

Composites are a combination of any of the basic metallic ceramic and polymer materials. Tooth-colored restorations are made from composite resin materials. These types of restorations may be placed in either the anterior or posterior teeth. Uses for composite material in dentistry will also be discussed later in the module.

II. MECHANICAL PROPERTIES OF DENTAL MATERIALS

It is important to know the composition of dental materials. To understand how a dental material will function in the mouth, you must first understand how the material will respond in the mouth. What is its strength? Will the material fracture when the teeth occlude? Will it discolor? It is easier to predict what a material will do, if you understand the basic properties of the dental materials.

A. Force

A force is any push or pull upon matter. The matter (object) moves or is changed in shape by the force. A force can be measured in pounds, such as 15 lbs. of force. In response to force, there is also stress and strain. Try to remember the saying, "For every action, there is a reaction."

There are three types of force:

1. Shearing force will shear material apart. Scissors will shear paper.
2. Tensile force pulls and strengths material. When children play tug-of-war tensile force is applied to the rope.
3. Compressive force pushes a material together. Biting and chewing uses compressive force.

B. Stress and Strain

Stress is an internal reaction, or resistance, within a body to an externally applied force. Stress cannot occur internally without an applied force outside. If the applied force is great, the stress within the material will also be great.

There are three types of stress:

1. Shearing stress is produced when a structure is twisted, rotated or deformed by sliding one part parallel to another part.
2. Tensile stress occurs when an applied force elongates (stretches a structure). For example, stretching a wire will cause the wire to become longer.
3. Compressive stress occurs when an applied force is pushed against a material.

Remember that each type of stress is capable of producing a deformation (distortion) in the body of matter. A tension or pulling force results in elongation of a body. A compressive or pushing force results in shortening of the body.

Strain is the distortion or change produced in a body as a result of stress. Every type of stress creates a type of strain. So, in reaction to tensile stress, tensile strain is created. Compressive stress is always accomplished by compressive strain and shearing stress is always accompanied by shearing strain.

C. Elasticity

Elasticity is the ability of a body (of matter) that has been changed under stress to assume its original shape when the stress is removed. An object that can gain its original shape when the stress is removed is elastic. A rubber band is said to be elastic because it can be stretched and will return to its original shape. An object which remains permanently changed after compressive stress is said to be inelastic.

Knowledge of the limit of dental materials is useful because it helps the dentist estimate when the shape of a dental appliance or restoration will be permanently changed by a given stress.

Study Questions

1. What is the difference between stress and strain?
2. What is the definition of force and elasticity?
3. State the three types of force?
4. What is the meaning of compressive stress?

D. Ultimate Strength

Ultimate strength is the greatest stress that a material can withstand without having the material fracture or rupture. The breaking point is referred to as a fracture. When the pressure applied to a tooth exceeds the strength of the tooth, a fracture will occur. It is important to place materials in the mouth that have great strength in order to prevent fracture.

E. Ductility

Ductility is the ability of a material to withstand deformation under tensile strength without fracture. Ductility decreases with increase in temperature.
If a dental structure needs to be bent or contoured, it is important that the structure will not fracture under pressure.

F. Malleability

If the metal is being compressed, its ability to withstand permanent deformation under compressive strength without rupture is known as malleability. Malleability increases with increase in temperature.
If a metal can be hammered or rolled into a sheet, it is malleable.

Most metals used in dentistry are ductile and malleable. Gold is the most ductile and malleable metal known, and placed in areas of the mouth where strength is very important.

G. Flow

Some materials continue to deform permanently under stress, even though the stress remains the same. When a glass rod is supported at both ends by its own weight, in time the glass eventually bows or flows (deforms) under its own weight. With dental materials, flow is usually measured under compressive strength. For example, a cylinder of material may be placed under compressive strength and the amount of flow measured. This is done by measuring the shortening in length of the cylinder.

Flow is also used to determine how impression materials and dental waxes deform under a constant pressure. Will the wax be able to withstand the biting forces in the mouth, and still give an accurate impression?

H. Hardness

Surface hardness in dentistry is generally measured in terms of resistance of a material to indentation. There are various tests available to determine the hardness of a material. A hardness test is very valuable in determining the properties of dental materials before they are placed in the mouth.

The hardness tests will not be discussed, so reference should be made to the Bibliography section of this module for additional reading.

I. Relaxation

By stretching or compressing a material to permanently change its shape, the internal structure of the atoms that make up the material are also re-arranged. This leaves the material in a state of tension, since the atoms would like to go back to their original arrangement. As time passes, the displaced atoms will move back to their original structure. The higher the temperature, the faster this action will occur. Once the stresses and strains are removed, and the internal structure is restored, the material has relaxed. The process by which this occurs is called relaxation. Such changes are important in dentistry because the result of relaxation may cause the misfit of an appliance or restoration.

J. Thermal Properties

Thermal conductivity is the ability of a material to conduct heat. Tooth structure is a great heat insulator. It has a low thermal conductivity value, which means under normal conditions the tooth can protect itself from thermal changes. Metal, on the other hand, is a great conductor of heat and cold. A tooth which has a metal restoration, may be sensitive to hot and cold if enough tooth structure has been removed. This is because the temperature at the pulpal floor of a large metal restoration is the same as the occlusal surface, and the heat or cold is then transferred to the pulp of the tooth. This is why some people experience sensitivity after a large or deep restoration is placed.

Temperature changes in teeth or dental materials will cause expansion and contraction. Even though the change in temperature is the same for the tooth and the material, the material will expand or contract at a different rate than the tooth.

Study Items

1. Define malleability.
2. Explain flow, and state an example.
3. Define relaxation.
4. Name a metal which is ductile and malleable.
5. Why may sensitivity occur after a restoration has been placed?
6. Explain thermal sensitivity.
7. Define the relationship between ultimate strength and fracture.

K. Adhesion

Adhesion is a process by which dissimilar materials are joined together or attached by the bonding of atoms or molecules. Some materials will not adhere or stick to a tooth structure because they do not contain similar molecules. Adhesion is the force which attaches these unlike molecules together. A stronger bond is formed when the molecules from two substances attach themselves together. The adhesion may be a strong physical force, or it can be a chemical reaction. An adhesive is a material which joins two materials together. The substance to which the adhesive is applied is referred to as the adherent. When placing cement on a tooth, the tooth would be the adherent.

In order for adhesion to take place, the materials being joined must be in close contact. The adhesive action of liquids involves four components which include: wetting, viscosity, film thickness, and surface tension.

1. **Wetting**

   Some dental materials will flow much easier over the surface of a tooth, even though the surface may be very rough. This characteristic of a liquid is called wetting. If an adhesive spreads over the surface in a thin film, the liquid is said to "wet" the solid well.

2. **Viscosity**

   The resistance to flow is known as viscosity. Different dental materials have different viscosities. A viscous material will be slow-flowing, due in part to the filler particles in the material. An example of a viscous liquid is syrup. A material which has a lower viscosity will 'wet" the surface well.

   Two additional factors which affect the viscosity of a material are time and temperature. Most dental materials will begin to set after they are mixed and the viscosity increases with time. An example would be most dental cements and impression materials. When a dental cement is first mixed, it is usually less viscous than when it begins to set.

3. **Film Thickness**

   Film thickness refers to the thickness of the adhesive films. The thinner the fill, the stronger the adhesive.

4. Surface Tension

Substances with a high surface tension have a strong cohesive force between the molecules. It is this attraction between the molecules that determines the surface tension of a material. For example, liquid mercury has a high surface tension and will form droplets when placed on most surfaces. Water does not have a high surface tension nor a low surface tension, but is somewhere in between. It forms droplets on some surfaces, such as rubber impression materials, but will spread when placed on a clean porcelain surface.

The higher the surface tension, the easier an adhesive will stick to it. Metals have a high surface tension and are easier to wet. Materials such as polytef (Teflon) have a low surface tension and are not easy to wet.

L. Mechanical Bonding

Mechanical bonding can be accomplished by the penetration of a semi-viscous glue or liquid into small irregularities in the tooth. The glue or liquid will flow into the irregularities and harden. The many finger-like projections act as "footholds" for mechanical bonding. Another example of mechanical bonding is in the use of resin (plastic) restorations. The resin will not bond to the tooth naturally, so an acid etch must first be placed. The acid etch will flow into the surface irregularities of the tooth and produce minute pores in the enamel. The resin is then placed into the prepared tooth surface and flows into these pores. When the material hardens, the finger-like projections once again improve the mechanical bonding of the restoration. The mechanical bonding helps to "lock" the material to the tooth surface.

The composition of enamel and dentin varies from one another. A material that will adhere to enamel is not likely to adhere to dentin.

Study Items

1. Define mechanical bonding and give an example how it relates to dentistry.

2. Explain adhesion.

3. Define adherent.

4. Define the term viscosity and what is meant by a viscous liquid.

FACTORS INFLUENCING DENTAL MATERIALS

Dental materials must be able to function in a wide variety of changes in the mouth. The oral cavity is a moist environment that can withstand extreme temperatures of heat and cold. The teeth must also be able to withstand pressure from the foods we eat and chew. If dental materials are used in the mouth, the materials must also be able to survive biting forces and changes in temperature. In addition to these requirements, materials in the mouth should:

1. Not be harmful or poisonous to the body;
2. Help protect the oral cavity and the tooth;
3. Not irritate or hurt the oral cavity;
4. Be aesthetically pleasing to the patient; and,
5. Restore the natural look and functions of the teeth.

The average person (with natural dentition) puts a biting force of 170 pounds in the posterior area of the mouth. To understand this better, 28,000 pounds of pressure per square inch is placed on a single cusp of a molar tooth. It is important to understand why materials placed in the mouth must be able to withstand an excessive amount of pressure.

Think of a day when the temperature outside has been 100 degrees or more. The temperature in your mouth can be as great as 100 to 150 degrees, and change to near freezing temperatures in a matter of seconds. Any type of dental material placed in the mouth must adapt to these sudden changes. As liquids pass over a tooth, the filling material and the crown of the tooth will expand and contract. It is now understandable why material placed in the tooth must expand and contract similarly to tooth enamel.

Some foods we eat are very acidic (acid-like), while some foods may be more alkaline (basic). Citrus fruits are acidic. A lemon is considered very acidic. When plaque is present on the tooth and sugar is eaten, acid is also produced. This acid may be harmful to the tooth and the dental materials in the mouth. Any type of acidic or alkaline substance allowed to remain on the tooth will deteriorate non-metallic materials, and corrode some metallic restorations.

Galvanic shock occurs when a small electrical current is created when two different metals are present in the mouth. Because the metals are wet with saliva, an action like that of a battery is created. When a metallic restoration is touched by a metal fork, a galvanic shock may occur. When placing metallic or gold restorations in the mouth, the dentist will consider what type of restoration may already be present.

Study Items

Can you list the eight factors that may influence the selection of dental materials.

If you can, check your answers with the list below. If you were not able to list the factors, review the section again.

Answer:

--The dental material must be able to withstand thermal changes in the mouth.

--The material must be able to withstand pressure from biting and chewing.

--The material should not be harmful or poisonous to the oral cavity.

--It should protect the oral cavity and the tooth structure.

--It should be aesthetically pleasing.

--The material should restore the natural contour and function to the tooth.

--The material should not easily break down when exposed to acid/alkaline in the mouth.

--Galvanic shock may occur when two different types of metals are placed in the mouth.

BASES, LINERS AND CEMENT BASES

I. CAVITY VARNISHES AND LINERS

A. Cavity Varnishes

Prior to placement of a restoration, the dental pulp may have been irritated or damaged. If the damage is extensive, a root canal may be needed first. If not, the dentin must be protected before the restoration can be placed. If a restoration is placed without first protecting the pulp, sensitivity may result. This can cause extreme discomfort to the patient, and interfere with normal occlusion.

When a tooth is prepared, it is very sensitive to the restorative materials and fluids of the oral cavity. To protect the dentin, a varnish first must be placed which will provide a barrier against these irritants. The varnish seals the dentinal tubules (microscopic holes in the tooth structure) and provides a layer of protection between the dental material and the dentin.

A cavity varnish is a natural gum product, or a synthetic resin, dissolved in an organic solvent. The cap should be placed back on the bottle after use because the material will evaporate.

Common brand name: Copalite

Note: When polycarboxylate and zinc oxide-eugenol cements are used, varnish is not necessary. These materials are non-irritating to the pulp. Varnish should not be placed under restorative resins. The solvent in the varnish may soften the resin material.

B. Liner

A liner serves basically the same purpose as a varnish, although it will not seal the dentinal tubules. It is applied to protect the underlying tooth structures, primarily the pulp. A liner also acts as a barrier to keep irritating substances away from the pulp. It should have therapeutical properties to help treat the pulp and encourage secondary dentin formation. In situations where the cavity preparation is deep, the liner will be placed before the varnish.

Liners containing calcium hydroxide promote secondary dentin formation. The liner should be placed as a thin layer over the pulpal floor.

Common brand names: Dycal, Procal, Renew, Zinc Oxcide-Eugenol, Zinc Phosphate, Zinc Polycarboxylate Glass-Ionomer (on top of a calcium hydroxide base), EBA, Calcium Hydroxide, Light Cure Dycal.

C. Cement Bases

When placing a cement base, the material should be of appropriate thickness to protect the pulp from thermal shock and chemical irritants. The base acts as a replacement for the dentin which has been lost due to caries or removed due to tooth preparation.

Some cements may be used as liners or bases. It is important to become familiar with the products used in the dental office, since the materials can be used interchangeably. The type of liner or base material selected will depend on the procedure and the type of restorative material being placed.

Common brand names: Zinc Oxide-Eugenol, Calcium Hydroxide, Zinc Phosphate, Zinc Polycarboxylate Glass Ionomer.

Different types of materials may be used as bases. When a zinc phosphate cement base is to be used, a cavity varnish, calcium hydroxide cement, or zinc oxide-eugenol should be placed first. The rationale for this sequence is to protect the pulp from the irritation of the phosphate cement.

II. CEMENTS

There are various uses for cements in dentistry. The selection of the cement type will depend on the type of clinical procedure and the restorative material being used.

Cement may be used for the following reasons:

--Cavity linings
--Luting (seals space between the casting and the prepared tooth)
--Temporary fillings
--Pulp capping
--Root canal sealing
--Retention of orthodontic brackets

A. Luting Cements

The function of a luting cement is to provide retention between the tooth surface and the restoration surface. The luting cement joins the surfaces by interlocking the surface irregularities of the tooth and the restoration. The luting cement is applied to the dentin.

Study Questions

1. Define cavity varnish and state one of its uses.

2. State two uses for a liner.

3. Explain the importance of calcium hydroxide in a cavity preparation.

4. Discuss the rationale for placing a base prior to restoring the tooth.

5. List two common brand names of dental cements which may also be used as a base.

6. State two uses for dental cements.

SECTION II.

PROPERTIES OF COMMONLY USED DENTAL MATERIALS

IMPRESSION MATERIALS

I. PURPOSE OF IMPRESSION MATERIALS

Impressions are used in dentistry to make a replica of an area in the mouth. Impressions can be taken of an edentulous arch, or a whole dentition. The material also is used for taking an impression of an area of the mouth that has been prepared for crown and bridge or inlays.

The type of impression material used is dependent upon the type of dental procedures planned. Some procedures require an impression material that is stronger and allows a more accurate impression of the area. Crown and bridge work require impression material of this nature. When impressions are needed for study models, as in orthodontic work, a less rigid impression material can be used.

The impression gives a negative reproduction or copy of the area. The impression is then filled with dental stone or other model material, and a positive model or cast is made. A positive model or cast means it is identical to that which is in the mouth.

Accuracy, quality, and detail are very important in the final model.

II. REQUIREMENTS OF AN IMPRESSION MATERIAL

A basic requirement for an impression material is that it can be placed in the mouth as a semi-liquid sol. The sol phase allows the impression material to easily flow around the structures in the mouth. After a certain amount of time, the impression material must set (harden) into a solid which is strong enough to be removed without deformity (tearing or falling apart).

Another desirable quality of dental impression material is accuracy. The impression should be able to reproduce the size and shape of the oral structure, including all fine details of the structure. The material should also have a pleasant odor, taste and aesthetic color. Many qualities are necessary for an ideal impression material; only a few have been mentioned.

III. TYPES OF IMPRESSION MATERIALS

A. Hydrocolloids

A colloid is a suspension of particles, or groups of small molecules, in some type of medium. A hydrocolloid is a colloid in which the medium is water. Hydro means water. A colloid has two phases: the sol phase and the gel phase. A hydrocolloid may be either reversible or irreversible.

1. Irreversible Hydrocolloids

a. Alginate

Dental alginate impressions may be used in the formation of temporary crowns, and primary impressions in edentulous mouths. The dentist may also require impressions taken of a patient's mouth for use later as study models for treatment planning, or orthodontic work.

Alginate material has good elastic qualities. It begins as a sol and within a matter of minutes reaches the gel phase. The material gels by a chemical reaction, and once the gel has formed it cannot be changed back into a sol.

The alginate powder is supplied in canisters or small sealed packets, and the mixing is relatively easy. Directions require that measured quantities of liquid and powder are mixed together. This step is important because the incorrect amount of water or powder will alter the mix and setting time, and also the strength of the impression. Alginate hydrocolloids, when used correctly and accurately, show details in the mouth. This accuracy is not as precise as reversible hydrocolloids.

Trays (disposable) are selected for size and fit in the patient's mouth. The alginate impression material is mixed and placed in the tray while in the sol phase. The material is then placed in the mouth and brought into contact with the oral tissues. The tray is held without movement until the impression material has set and reached the gel phase. The tray with the impression material is removed from the mouth, disinfected, and a dental material is poured into the impression to make a positive model for the area.

Alginate dental impression material is less expensive when compared to other impression materials.

Disinfection of the dental impression material is also necessary because viruses may be transferred to other dental personnel who come in contact with the impression material. It may be necessary to review Fundamentals II, Infection Control Guidelines for dental materials.

Common brand names: COE Alginate, Caulk/Dentsply Jeltrate Plus, S.S. White Alginate, and others.

2. **Reversible Hydrocolloids**

a. **Agar-Agar**

Agar is obtained from certain types of seaweed, and is more compatible with gypsum products than alginate. Reversible hydrocolloids are used when final impressions are needed for crown and bridge work.

The preparation of agar colloids requires additional equipment and preparation time, when compared to other impression materials. This factor does not decrease the performance of the material. Agar hydrocolloids, when used correctly, provide excellent detail and accuracy.

Alginate impression material is not suitable when a final impression is needed for a crown or bridge preparation. The material does not form a gel that is strong enough to reproduce the minute details. The agar hydrocolloid impression materials are reversible agar gels. When this material is heated, it will go into the sol state, and when cooled it returns to the gel state. This process can be repeated over again, thus making the material reversible.

The agar gel is contained in tubes of varying size. The tube is immersed in boiling water for a period of time. After boiling, the tube is then placed in warm water and manipulated to ensure even cooling. The tube is opened and a tray is filled with the agar gel. The filled tray is tempered (brought to the correct temperature) in water. The material is placed in the mouth, and the impression material is cooled by tap water which circulates around tubes built into the tray. The correct temperature must be maintained to prevent distortion of the impression material. Once the material has set, the tray is removed.

From a patient's point of view, this material may cause thermal shock to the teeth, because the material is heated before being placed in the mouth. Thermal sensitivity may also occur when the material is cooled to reach a solid state.

Brand names: Lactone-Surgident, Lacona-Thompson, and Van R.

b. Agar-Alginate

The agar impression materials have adequate strength and elastic properties, which allow specific duplication of undercuts. The advantage of the agar-alginate system compared to the agar system is the simplicity of the system.

A syringe type of agar in a cartridge is heated in boiling water for a specific amount of time. Regular set alginate is then mixed with approximately 10% more water, and placed in the tray. The agar is then injected around the prepared area and the alginate tray is placed on top of the agar material. During the setting time, a bond begins to form between the agar and the alginate. The tray is removed after the material has set.

Common brand names: Cohere, Dentloid, HNSY

3. Rubber Impression Materials

Rubber impression material, another type of final impression material, is used in dentistry. This material is not a gel, but possesses a more rubber-like quality. It is superior to irreversible hydrocolloids for final impressions. When handled correctly, the material is comparable to reversible hydrocolloids in terms of accuracy and reproduction of tissue.

The rubber impression material can be used for almost any type of impression. However, the primary use for this material is to create final impressions for inlays, crowns, and bridges.

This material, which is synthetic rubber, is referred to as elastomeric. The process of changing this elastomeric base, into the final rubber-like material is known as curing. The curing of this material is a chemical reaction, and begins when the materials are mixed together. Curing occurs in two stages:

--The initial set (first stage) results in a stiffening of the paste, but no elastic properties.

--The final set (second stage) is when the material begins to have an elastic appearance, and soon changes to a solid rubber mass.

There are three major types of rubber impression materials that will be covered: Polysulfides, Silicones, and Polyethers.

a. Polysulfides

Polysulfide impression material is a paste that is supplied in collapsible tubes. The tubes are labeled base and accelerator.

The Polysulfide base, which is usually white, is formed into a paste by the addition of fillers. The second tube contains a paste which produces a reaction that forms the soft rubber. This tube is labeled accelerator or catalyst, and contains sulfur and lead dioxide.

A liquid plasticizer is added to these two powders to form a paste. Special care should be taken with this material, since it will have a tendency to stain clothing, and produces a strong odor.

b. Silicones

Two types of silicones are used as rubber base impression materials. The impression materials are classified by their chemical reactions as condensation and addition types.

1) Condensation silicones are also supplied as a base and an accelerator, and come in collapsible tubes. The base contains fillers, and may have the consistency of putty. The accelerator may be a liquid, or with the addition of a thickening agent, paste consistency. This type of impression material is odor free, relatively easy to mix, and clean to handle.

   To mix the base and accelerator, a measured length of base and accelerator paste are squeezed onto a mixing surface. The material is mixed until a homogenous, streak-free mix is obtained.

   To mix the base paste and liquid, a measured amount of base is used and a specified number of drops are added of liquid reactor. The material is mixed until a homogenous, streak-free mix is obtained.

   Ethyl alcohol is released as a by-product of the reaction. This causes the impression material to have a relatively high curing shrinkage, and poor dimensional stability. The impression should be poured immediately.

   Common brand names: Coltex, Coltofax, Optisil Plus, Siccoform, Verone, and others.

2) Addition types of impression material are available in very heavy, heavy, medium, and low putty consistencies. The chemistry and properties of addition silicone is much different than condensation silicone. Additional reading is suggested to understand the properties of the two silicones.

The material is supplied as a two paste system in metal tubes, or plastic jars if the putty material is used. The mixing of materials is the same as for silicone impression material. The additional silicones are odor free, easy to mix, and clean to handle.

No by-products are produced when the base and accelerator area mixed together. The curing shrinkage is small and the dimensional stability of the product is good. Most manufacturers state that the pouring time can be delayed up to seven days.

Common brand names: Exaflex, Express, Precise, Permagum, Reprosil.

c. **Polyether**

The base and reactor are supplied as pastes in collapsible tubes. The material as it sets, is quite stiff, so a third material, called a thinner or body modifier, is available to reduce the stiffness. The thinner will reduce the viscosity of the unset material.

The polyethers are odor free, clean to handle, and easy to mix. The working time is very short, but can be extended. The polyether does not produce a by-product, and the curing and dimensional stability is comparable to addition silicones. The polyethers will absorb water and swell, so the impression should be stored in a dry area.

Some people have been known to have a reaction to this type of material. If a known hypersensitivity exists, another impression material should be chosen.

Common brand names: Impregum, Permadyne (two viscosity system).

3. Techniques for Rubber Impression Material

Two types of techniques are possible for taking rubber base impressions.

The first technique involves a one-step, single impression. It involves the mixing of materials with two different viscosities, and requires the following steps:

a) First, the lower viscosity material is mixed and placed in a syringe.

b) The material is then placed in the mouth and injected in the cavity preparation, and other areas where detail is needed.

c) The higher viscosity material is mixed as step #3 is taking place.

d) The high viscosity material is placed in a tray and placed in the patient's mouth until the material has set.

Some materials have only a single viscosity, so the mix would be prepared twice. As the viscosity increases, the material is then used in the tray.

The second basic technique requires a two-step impression process. A first impression is taken of the area, using a putty viscosity type of material. The impression does not have to produce accurate detail. The steps for this second technique are:

a) The lower viscosity material is mixed and placed in a syringe.

b) The material is then injected into the cavity preparation.

c) The first impression material is reseated in the mouth, over the syringe material.

d) The tray is held steady, and then removed when the syringe material is set.

Study Items

1. List two uses for impression material in dentistry.
2. State a basic requirement for an impression material.
3. Define the terms hydrocolloid and colloid.
4. List two types of reversible hydrocolloids.
5. Describe one major type of rubber impression material.
6. State one disadvantage or polysulfide impression material.
7. State one advantage of polyether impression material.
8. Describe the two types of techniques that may be used when taking rubber base impressions.

DENTAL CEMENTS

I. CEMENTS

There are various uses for cements in dentistry. The selection of the cement type will depend on the type of clinical procedure and the restorative material being used.

Cements may be used for the following reasons:

1. Cavity Linings
2. Luting (seals the space between the casting and the prepared tooth)
3. Temporary Filling
4. Pulp Capping
5. Root Canal Sealing
6. Retention of Orthodontic Brackets

Table 1 outlines classification and uses of various dental cements. Because luting cements are frequently used in dentistry, a discussion of common luting materials follows.

A. Luting Cements

The function of a luting cement is to provide retention between the tooth surface and the restoration surface. The luting cement joins the surfaces by interlocking the surface irregularities of the tooth and the restoration. The luting cement is applied to the dentin exposed in the cavity preparation.

Luting cements can be applied as a permanent or temporary cement. Temporary cementation of crowns or bridges is necessary until the permanent crown or bridge is prepared. Once the permanent crown or bridge is placed, a more permanent type of cement is used.

Sensitivity can be a problem when tooth structure has been removed. An advantage of glass ionomer cement is the release of fluoride into the tooth structure, providing a resistance to secondary caries.

Luting cements must have a high compressive strength. The cement must be able to "hold" the restoration, etc., to the tooth structure even when excessive force (e.g., biting or chewing) is applied.

The luting cement must also form a seal between the material and the tooth, preventing microleakage. If bacteria or irritants are allowed to leak inside the tooth, sensitivity or secondary caries may result.

B. Types of Luting Cements

1. Zinc Phosphate Cement

This cement is supplied as a powder and a liquid. When the two materials are mixed together, heat is produced. Care should be taken when mixing the material and placing it in the cavity preparation, as heat can damage the pulp. To avoid overheating, mix by slowly incorporating the powder into the liquid.

At times, an operator may want to prolong the working time available before using zinc phosphate cement. Extended mixing will prolong the working time. When the temperature of the glass mixing slab is cooled, the chemical reaction will be slowed. Although additional time may be allowed, the hardening or setting time of zinc phosphate cement should be accurately controlled.

Zinc phosphate cement does not adhere to the tooth structure. Retention of the casting to the tooth is achieved primarily by the design of the cavity preparation. The cement merely aids in adhesion, which takes place by a mechanical locking of the surfaces being joined. For example, when a crown is cemented on a tooth, the cementing agent flows into the surface irregularities of the tooth and the crown in place.

The thinner the cement film, the better the retention of the casting and the prepared cavity. If the cement is too thick, it will interfere with the cementation of the casting and the tooth. If the cement is not adequately mixed, the acid in the cement is free to penetrate the dentinal tubules which causes tooth sensitivity.

Zinc phosphate is sensitive to oral fluids in the mouth during the first 24 hours. It is recommended that a cavity varnish be placed over the margins of the restoration to protect the cement during this period.

This cement may be irritating to the pulp. Calcium hydroxide and a cavity varnish should be applied in the cavity preparation prior to placement of zinc phosphate.

Common brand names: De They's Zinc, Fleck's.

2. Zinc Oxide-Eugenol Cement

The zinc oxide-eugenol cements are less irritating to the pulp, and are often used with deep restorations. The eugenol has sedative properties which are soothing to the pulp.

Zinc oxide-eugenol cements are more soluble than zinc phosphate cement. When a material is more soluble, there is a greater risk of microleakage and, thus, a greater chance of secondary caries or sensitivity. The cement may be affected over a period of time by the fluids in the oral cavity.

Traditional zinc oxide-eugenol cements did not have the compressive strength needed for a luting agent. Additional fillers have been added which improve the compressive strength of these cements. These cements may be referred to as "modified", "reinforced", or "improved" zinc oxide-eugenol cements.

When mixing zinc oxide-eugenol cement, the rate at which the powder is incorporated into the liquid is not as critical as with other cements.

Common brand names: Reinforced Zinc Oxide-Eugenol Cement, Zinc Oxide Improved Powder.

3. Polycarboxylate Cement

Polycarboxylate cement absorbs water, and if the film thickness is excessive, the luting cement may soften and be dissolved by oral fluids. Although polycarboxylate cement does not possess any therapeutic properties, this cement is less irritating to the pulp.

The proper mix of polycarboxylate cement is shiny and has a glossy appearance. The cement is somewhat thick, but will form a thin strand when picked up by the spatula. When the mixing time is prolonged, the cement will become tacky, and take on a dull appearance. This loss of gloss is unacceptable, so a new mix should be prepared.

The tooth must be cleaned before placing the cement in the cavity preparation. Pumice may be used in a slurry, and then the preparation must be rinsed and dried.

The compressive strength of this cement is less than zinc phosphate cement.

Common brand name: Durelon.

4. **Glass Ionomer Cements**

These cements adhere chemically to both the dentin and enamel of the tooth. The slow release of fluoride from Glass ionomer luting cement is the major advantage of this material.

There are various types of Glass ionomer cements,(Type I and II), which are used for the restoration of anterior teeth, as well as for luting agents for restorations.

Glass ionomer cements have a short working time, and the setting time can be slowed when the glass slab has been cooled.

The tooth should not be overly dried before placing the cement. Instead, a quick blast of air is used to remove any excess moisture. Completely drying the tooth may open the dentinal tubules allowing irritation to the pulp, causing sensitivity after the cement is placed.

While the material is setting, a layer of varnish is applied to protect the cement from oral fluids because initially, the cement is very soluble to oral fluids in the mouth.

Common brand names: Aspa, Chembond, Fuji, Aqua Chem, Ketac-Bond, Ketac-Cem.

5. **Resin Cement**

Resin cement can be irritating to the pulp, so the pulpal floor should be protected by a layer of calcium hydroxide.

This cement does not adhere to the tooth structure. The solubility of the cement may be affected over a period of time when exposed to oral fluids.

The film thickness may be higher with these cements, and difficulty may occur when cementing the casting.

Common brand names: Caulk Comspan.

Study Items

1. List 3 uses for dental cements.
2. State the function of a luting cement.
3. Name 2 uses for a luting cement in dentistry.
4. Explain why it is important to slowly incorporate the powder into the liquid with zinc-phosphate cement.
5. List 2 advantages of using zinc oxide-eugenol cements.
6. State the major advantage of Glass ionomer cements.
7. Explain why it is important not to over-dry the cavity preparation before placing a Glass ionomer cement.

TABLE 1
CLASSIFICATION, USES OF DENTAL CEMENTS

CEMENT	INDICATIONS
ZINC PHOSPHATE	Luting agent for restorations. Thermal-insulating base in deep cavity preparations (calcium hydroxide and a cavity varnish should be applied prior to placing zinc phosphate). Temporary restorations in primary and permanent teeth.
ZINC OXIDE-EUGENOL	Temporary restorations. Temporary and permanent luting agent for restorations. Thermal insulating base.
POLYCARBOXYLATE	Luting agent for restorations. Thermal insulating base.
GLASS IONOMER	Luting agent for restorations. Class V restorations. Anterior restorations. Thermal insulating bases.
RESIN	Luting agent for conventional crowns and bridges. Luting agent for restorations. Temporary Restorations.

RESTORATIVE MATERIALS

I. TYPES OF RESTORATIVE MATERIALS

Many types of restorative materials are available for preparing tooth structure. A restorative material does not replace the original structures of the tooth, but serves as a functional substitute for the tooth.

The most common materials available for restoring teeth include the following:

Amalgam
Resins (composite resins)
Glass Ionomer Cement
Other Cement Materials
Cast Gold or Metal (this information will not be covered)

When a carious lesion is present in a tooth, the decay must be removed, the cavity must be prepared for restoration, and a restorative material must be placed. Circumstances also occur where replacement of tooth structure is necessary for reasons other than decay (e.g.,: fractured teeth, replacement of existing restoration, aesthetics, etc.).

The type of restorative material used will depend upon the procedure being preformed, and the personal preference of the dentist and patient.

A. Amalgam

Amalgam is one of the oldest restorative materials used in dentistry. The demand for amalgam restorations has lessened, due to the advancements in tooth-colored restorative materials.

Since amalgam does not adhere to enamel or dentin, the preparation of the tooth must be able to retain the amalgam within its structure. When large restorations are placed, significant tooth structure is lost and the remaining tooth structure is weakened.

Mercury is a component of dental amalgam and should be handled with caution. The mercury and the amalgam should not be touched with the hands.

When used, amalgam is usually dispensed in capsules and placed in an amalgamator which mixes the elements together. The amalgam is then condensed (placed) in the cavity preparation. Because amalgam is silver in color, it generally is used in posterior teeth.

B. Resins

A synthetic resin is an artificially produced, nonmetallic compound which can be molded into various forms and then hardened. Resins are used in dentistry for a variety of reasons. For example, dentures, restorative materials, and temporary coverage for a tooth. Before a resin can be used as a final product, the material must be hardened by a process called polymerization.

Monomers are single particles. When these molecules join together, they form a polymer or chain. The joining together of these molecules is known as polymerization.

Polymerization, also known as curing, takes place when the catalyst or initiator becomes chemically activated. This process affects the monomer and the material begins to set.

In relation to resin material, polymerization may occur in one of three ways: self-cured, heat-cured, or light-cured.

> Heat-cured resins require heat under pressure to bring about a reaction, for example, in the fabrication of dentures in a dental lab.
>
> Light-cured resins must be exposed to a light source for polymerization to take place, for example, composite restorations.
>
> Self-cured resins react when the base and the catalyst (accelerator) are mixed together manually, for example, pit and fissure sealants.

1. Composite Resins

Composite resins are tooth-colored restoration material originally designed for use in the anterior teeth. Composite restorative material has recently been designed for use in the posterior teeth as well.

Composite restorative material consists of an organic polymeric matrix, commonly the BIS-GMA resin system. The matrix has inorganic filler such as glass, quartz, or silicate particles. The filler has been added to the material to give the dental material a desired quality, for example, added strength. The materials may also contain elements which make the material radiopaque, so that it can be seen on a dental x-ray.

Composites are available as a single paste system, a powder-liquid system, or a two-paste system. It is important to follow manufacturer's directions because materials may vary, as well as the method of polymerization.

Moisture will inhibit the polymerization reaction, so the material should be protected from moisture during setting. ZOE (Zinc Oxide-Eugenol) cement will also interfere with the polymerization reaction, so the composite material should not be in direct contact with this cement.

The blending of shades for aesthetic restorations is very important. The shade selected must match the color of the tooth structure. The color of shades will vary with the type of composite product used.

Composite resins can be irritating to the pulp, and a Glass ionomer dentin bonding agent or calcium-hydroxide liner should first be placed.

Study Items

1. List 4 types of common restorative materials used in dentistry.
2. Define synthetic resin.
3. List 2 uses for resin material in dentistry.
4. Define polymerization.
5. Describe the 3 ways polymerization may occur with resin material.
6. State the composition of composite restorative material.
7. Explain why it is important that ZOE does not come in direct contact with composite material in a cavity preparation.

a. Classification of Composite Resins

Materials and techniques in the use of composite materials may vary somewhat with each individual operator. Due to the variations in the products, the manufacturer's recommendations should be followed when using any composite materials.

There are several classifications to describe composite resins. These will not be covered in great detail, but it is important to know the composition of the composite material may vary with each type of composite material used. Some composite material may contain finer filler particles compared to other composite material which may contain larger particular sizes. The particle size will affect the desired outcome of the composite material.

*Macrofilled or Conventional Composites

The large particles shapes are more resistant to abrasion and more difficult to polish. The large particles in the conventional filler have regular particle shapes such as rods and spheres. Various materials are included in the filler, which is radiopaque.

The large particle shapes cause the finish surface to remain rough. The rough surface creates an area where plaque may accumulate.

Common brand names: (1970) Adaptic, Concise, Profile. Light activated: Fotofil, Nuva-fil, Prisma-fil, Visio-fil.

*Microfine Composites

The microfine particles polish well, but are not as resistant to abrasion as the large particles. Microfine particles may discolor over time.

Common brand names: Elastic Microfil, Silar, Topaz. Light activated: Durafill, Heliosit, Silux, Topaz, Visio-Dispers.

***Hybrid Composite**

The Hybrid material combines the advantages of the large and microfine composites and particle sizes will vary. Rounded shapes of particles improves the packing of the material, and limits the amount of material needed.

Common brand names: Self-cured brands: Bioglass, Miradapt, P 10, Vytol. Light activated: Aurafill, Brilliant, Command, Ultrafine, Lumifor, Profile TLC, Hericulite.

b. Acid Etch and Bonding of Composite Resins

Acid etch is used on the prepared enamel surface prior to placing the composite. Acid etch provides a higher surface area to enhance wetting, increased surface area for bonding, and a demineralized porous area into which the composite material can flow.

To ensure that the composite will adequately bond to the enamel, the surface must be adequately etched and isolated from moisture and oral fluids. The bond which takes place between the enamel and the composite resin is primarily mechanical.

Several acids are available to etch the enamel surface. The most commonly used acid is a buffered phosphoric acid, which is supplied either as a liquid or a colored gel. It is important not to etch beyond the prepared enamel surface, which would allow the etch to contaminate the dentin or lining surface.

The etch should be dabbed on the surface, not rubbed. Rubbing the surface will fracture the enamel lattice work formed by the acid etch. The etch should remain on the tooth the required amount of time. The tooth is then rinsed and dried. The properly etched tooth surface will appear white and frosty when dried.

Manufacturers may vary in the amount of time that is required to etch and rinse. Always follow the manufacturer's directions for the type of material being used.

Materials have also been developed which form an adhesive bond to the dentin vs. a mechanical bonding with the acid etch and enamel. The bonding of dentin to the composites by acid etching (phosphoric acid) is not suggested. Acid etch when exposed to dentin, will open the dentinal tubules (which lead to the pulp) and may expose the pulp to chemical irritants. Dentin-bonding agents are applied in a manner similar to acid etch.

In the area of aesthetic materials, such as composite restorations, the improvement in dental materials has been significant. Changes are evidenced by the extended application of composites as posterior restorative materials. Because a number of composite products are available today, the selection of restorative material will be dependent upon the procedure being performed, as well as the personal preference of the dentist.

Light-cured composites are easy to manipulate from the standpoint that additional time can be taken to prepare and place the material.

When light-cured materials are used, caution should be taken not to stare at the light source. This can lead to permanent eye damage. Protective shields are available to protect the eyes when using the light.

Study Items

1. Explain the need for acid etch prior to placing a composite restoration.
2. Describe the correct application of acid etch.
3. Describe the appearance of a properly acid etched tooth.

c. Composites for Posterior Restorations

Recently, materials have been developed specifically for use in the posterior teeth. These have hybrid particle size to increase strength and have some radiopacity. Changes are likely to occur in the techniques and materials as future improvements are made.

Common brand names: Estilux Posterior, Ful-fil, Helio-Molar, Herculite, Occlusion, P 30.

d. **Finishing the Composite Material**

After the composite restoration is placed, the material must be finished to achieve a result which is non-irritating to the gingiva.

The finishing procedure should achieve the following desired results:

*A restoration contour that is acceptable to the surrounding tissue. The finished restoration should not be bulky or impinge on the tissue.

*The surface should be smooth and reflect light similar to that of the tooth structure.

*The cavosurface margin should be smooth, and flush with the tooth surface.

*The occlusal relationship of the teeth should not be affected.

*The contour of the restoration should follow the normal contour of the tooth, and be aesthetically pleasing.

Obtaining a smooth surface should be achieved by using an abrasive product that has abrasive particles, which are fine in size. The fine particles will not remove the composite material, and will leave only microscopic grooves in the material.

A course disk is used initially for the gross removal of the excess material, followed by finer disks which produce a smoother surface texture. The sequence and use of the disks may vary with individual operators.

A high-speed handpiece is used by the dentist for finishing posterior and anterior composites when additional contouring or anatomy is needed.

d. Other Uses for Composite Resins

The following are additional uses for composite resins and vary somewhat from the composite restorations used to replace tooth structure.

1. Porcelain Bonding

For various reasons, a porcelain crown or bridge may fracture and a portion of the porcelain may break off. It is not always necessary to remove the crown or bridge to repair the fracture. The porcelain is roughened to allow for better mechanical retention, and a composite material is bonded to the chipped area.

A patient's occlusion should always be taken into consideration when repairing, or adding material to an existing restoration, crown, etc. The patient may not have ideal occlusion, in which case the biting force is not evenly distributed on the teeth. It is important to maintain or restore an occlusal relationship that will be functional for the patient.

2. Anterior Veneers

A veneer is a layer of tooth-colored restoration that is attached to the surface of a prepared tooth or teeth. Veneers may be placed on teeth that are discolored or stained, or to improve the contour of a tooth or teeth. Sometimes the stain or discoloration is within the tooth structure (intrinsic), and cannot be removed by scaling or polishing.

Different types of material may be used to fabricate a veneer. Conventional composite resins or microfilled resins may be used, or porcelain veneers are also available.

Tooth-colored restorative material may be added to the prepared tooth in one appointment, or the veneer may be fabricated in the laboratory, in which case, the patient would need an additional appointment for cementation of the veneer.

3. **Cement Material/Glass Ionomer**

Glass ionomer cement is not radiopaque. Silver particles have been incorporated into the material which give it radiopaqcity and an increased resistance to abrasion. This version is referred to as Cermet cement.

Glass ionomer is useful in restoring some types of restorations, and has been used as a base in conjunction with a more abrasive or resistant composite or metal restoration. It serves as a build-up material when additional tooth structure is needed.

Common brand name: Miracle Mix.

Study Items

1. List 4 desired results of a finish composite.
2. State how a smooth surface is obtained when finishing a composite material.
3. Define veneer.
4. State one use of Glass ionomer cement, other than as a luting agent.

GYPSUM MATERIALS

I. GYPSUM PRODUCTS

Gypsum products serve many purposes in dentistry. A few of the uses for gypsum products in dentistry are: impression materials, dental stone for a model used in the fabrication of a crown or bridge and in the construction of dentures.

Decreasing the water/powder ratio, excluding air from the mix, and increasing the density of the plaster or stone, will increase the hardness as well as the strength of the gypsum product.

The following factors will affect the setting time of the gypsum product:

*Manufacturing process-the amount of gypsum crystals in the powder will affect how fast the material will set. The more porous the material the faster the setting time.

*Water/powder Ratio-the addition of more water, will prolong the setting time.

*Temperature-usually temperatures higher than normal, will increase the setting time, and vice versa.

*Mixing-the longer the gypsum product is mixed, the shorter the setting time.

*Retarders and Accelerators chemicals may be added which shorten the setting time (accelerators), or lengthen the setting time (retaders).

There are three types of somewhat pure gypsum products used in dentistry: impression plaster, model plaster, and dental stone.

A. Impression Plaster

Great strength is not a requirement of impression plaster. The material should also have a short setting time, and a low setting expansion.

A higher water/powder ratio is usually used when mixing impression plaster. This reduces the strength and allows the impression to be withdrawn easily. If the impression material has great strength, it would set around the teeth and become difficult to remove. For this reason, impression is not frequently used in the oral cavity.

B. Model Plaster

Model plaster is mixed with water to form a paste-like mass which hardens into a material similar to dental stone.

An impression is first taken of the area. The plaster is mixed with the water and poured into the impression. When the plaster has set, the impression is pulled away from the model and an exact replica or cast of the area is formed. The cast is then used in the fabrication of dental appliances, crown and bridge work, etc.

The powder particles of plaster are usually rough, porous, and randomly shaped. Because the powder is porous, too much water will weaken the final product and affect the strength and hardness of the material.

C. Dental Stone

The powder particles of stone are somewhat different than plaster. The particles in the stone are smooth, well-crystallized, and less porous.

The water/powder ratio for dental stone is much different than that of plaster. This material does not require as much water, due to the smooth, dense particles.

Dental stone contains modifiers which regulate the setting time, and more time should be allowed for dental stone than plaster.

Stone is naturally white, and hard to distinguish from plaster. To eliminate the problem, color is added to the stone.

Study Items

1. State 2 uses for gypsum products in dentistry.
2. List 4 factors which will affect the setting time of gypsum products.
3. Describe 2 types of gypsum products used in dentistry.
4. Describe the powder particles of dental stone.
5. State why color is added to dental stone.

FINAL STUDY QUESTIONS

1. What is one example of a man-made polymer?

2. Composites are a combination of what materials?

3. What type of force pushes a material together?

4. Stress is an internal reaction, or resistance, within the body to what type of force?

5. ________________ is the distortion or change produced in a body as a result of stress.

   a. elasticity
   b. compressive stress
   c. shearing stress

6. ________________ is the ability of a material to withstand deformation under tensile strength without fracture.

   a. elasticity
   b. compressive strength
   c. ductility

7. What metal is the most ductile and malleable?

8. What type of changes will cause expansion and contraction of dental materials placed in the oral cavity?

9. ________________ is a process by which dissimilar materials are joined together or attached by the bonding of atoms or molecules.

   a. wetting
   b. adhesion
   c. bonding
   d. curing

10. The resistance to flow is known as what?

11. What is one requirement of a dental material that is placed in the mouth?

12. A ______________ seals the dentinal tubules?

13. In situations where the cavity preparation is deep, the ______________ will be placed before the __________________.

    a. cavity varnish, liner
    b. liner, cavity varnish
    c. restoration, liner
    d. restoration, cavity varnish

14. Cements may be used in dentistry for what purposes?

    a. luting
    b. bases and liners
    c. sealing the dentinal tubules
    d. a and b
    e. a and c
    f. b and c

15. Impressions are used in dentistry to make a __________.

    a. positive reproduction of an area in the mouth.
    b. negative reproduction of an area in the mouth.

16. The ______________ phase of an impression material allows the impression material to easily flow around the structures of the mouth.

17. What are two types of reversible hydrocolloids?

18. Three major types of rubber impression materials used in dentistry are ________________.

19. The function of a ________________ is to provide retention between the tooth surface and the restoration surface.

20. Zinc phosphate cement is sensitive to oral fluids in the mouth during the first _________ hours after cementation.

    a. 5
    b. 10
    c. 20
    d. 24

21. ________________ cement is often used with deep restorations because of the sedative properties of the cement.

    a. zinc phosphate
    b. Glass ionomer
    c. zinc oxide-eugenol

22. What type of cement adheres chemically to both the dentin and enamel of the tooth?

    a. zinc phosphate
    b. zinc oxide-eugenol
    c. Glass ionomer

23. ____________ is the oldest restorative material used in dentistry.

24. ___________ resins react when the case and the catalyst are mixed together manually.

    a. Heat-cured
    b. Light-cured
    c. Self-cured

25. A properly acid etched tooth surface will appear ____________.

    a. glossy
    b. frosty and white
    c. the color of the tooth
    d. glossy and white

26. Acid etch forms a ___________ bond with the enamel.

    a. chemical
    b. mechanical

27. Dentin bonding agents form a __________ bond with the dentin.

    a. chemical
    b. mechanical

28. What are two desired results of a finished composite restoration?

29. The longer a gypsum product is mixed, the ___________ the setting time.

30. Dental stone requires ___________ than dental plaster.

a. more water
b. less water

BIBLIOGRAPHY

Phillips, Ralph W., M.S., D.Sc. Elements of Dental Materials, Philadelphia: W.B. Saunders Company, 1984.

Smith, Bernard, G.N., Wright, Paul S., Brown, David. The Clinical Handling of Dental Materials, Bristol, Great Britain: 10P Publishing LTD., 1986.

Craig, Robert, Ph.D. Restorative Dental Materials, 8th Edition, St. Louis: C.V. Mosby, 1989.

Torres, Hazel O., G.D.A., R.D.A., R.D.A.E.F., M.A., Erlich, Ann, C.D.A., M.A. Modern Dental Assisting, 4th Edition, Philadelphia: W.B. Saunders Company, 1990.

SUGGESTED READINGS

Elements of Dental Materials, Ralph W. Phillips, M.S., D.Sc.

Restorative Dental Materials, 8th Edition, Robert Craig, Ph.D.

Modern Dental Assisting, 4th Edition, Hazel O. Torres, C.D.A., R.D.A., R.D.A.E.F., M.A. and Ann Erlich, C.D.A., M.A.

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Module 2

APPLICATION OF PIT AND FISSURE SEALANTS

Module 2-A

APPLICATION OF PIT AND FISSURE SEALANTS

Instructor/Student Module

APPLICATION OF PIT AND FISSURE SEALANTS
A Self-Study Module

developed by
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June, 1991

Adopted by
Idaho State Board for Vocational Education
650 West State Street
Boise, Idaho

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INTRODUCTION

On July 1, 1989, the application of pit and fissure sealants was recognized as a legal procedure for Idaho dental assistants to perform under the direct supervision of a dentist. Assistants must first successfully complete coursework approved by the Idaho State Board of Dentistry. A certificate or diploma of course completion as issued by the teaching institution will be the assistant's verification of compliance with Board standards. This module was designed to be utilized by Board-approved teaching entities. It offers basic information on the application of pit and fissure sealants which is intended to be supplemented with formal classroom, laboratory and clinical instruction.

The procedure described in this module represents one method for sealant placement. There are several minor variations of this technique, which are dependent upon operator preference and current research. The videotape that accompanies this module was originally developed by Ardean Nickerson, Eastern Washington University. Although it was produced a few years ago, the basic technique for sealant application has not changed significantly. The original videotape has been edited by Idaho State University to include more recent developments on this topic.

The exact technique used by the reader in clinical practice will depend, to an extent, upon individual office philosophy. For example, there are a variety of opinions regarding appropriate etching times and procedures for preparing/cleansing teeth to be sealed. Whichever technique is employed, the reader is advised to refer to the manufacturer's instructions prior to working with any new material.

To acquire the knowledge and skills necessary to place pit and fissure sealants, the following instructional pattern is suggested:

1. Read the module in its entirety and answer the study questions that are included at the end. Familiarize yourself with the armamentarium that will be needed. Also review the practice activities and evaluation mechanisms that are included in your course outline.

2. Review the videotape of the procedure during a class session. The videotape presents the operator's view, thus enabling you to see all steps of the procedures as you will be you performing them.

3. Perform all activites listed in the course outline. Complete self-evaluations as well as instructor evaluations as you progress.

At the end of the practice sessions, a short written test will be administered. Your instructor will provide further information about the final clinical certifying exam during your course.

COURSE DESCRIPTION
APPLICATION OF PIT AND FISSURE SEALANTS

Clock Hours

Lecture/Demonstration:	2 hours
Laboratory and Clinical:	5-1/2 hours
Written Examination:	30 minutes
Final Practical Examination:	For the convenience of both students and examiners, it is suggested that the final exam for this course be offered concurrently with the final exam for coronal polishing. By doing so, it will be necessary to obtain only one patient.

Course Description

The primary goal of this course is to provide the dental assistant with background knowledge and clinical experience in applying pit and fissure sealants. Upon successful completion of this course, the student will receive a certificate of completion/recognition indicating competency in performing this procedure.

Required Text

Application of Pit and Fissure Sealants, a self-study module developed by Carlene Paarmann, RDH, MEd, Idaho State University, 1991.

Course Requirements

1. Attend all class, laboratory, and clinical sessions.
2. Place two acceptable pit and fissure sealants on extracted teeth: one self-cured and one light-cured.
3. Place one acceptable[†] sealant on a student partner (material of choice by student).
4. Place four acceptable[†] sealants on clinical patients (material of choice by student):
   - -one maxillary and one mandibular sealant on an adult patient
   - -one maxillary and one mandibular sealant on a child patient
5. Achieve a minimum of 75% on the written examination.

[†] see *Pit and Fissure Sealant Evaluation Form.* If a critical task (marked on

evaluation form with *) is not completed, the evaluation is automatically unsatisfactory and must be redone. A **minimum score of 86%** must be acheived on each sealant.

6. Successfully complete the final practical examination to receive a certificate of completion/recognition to perform this function (one acceptable maxillary and one acceptable mandibular pit and fissure sealant--may be same patient as used for coronal polishing final exam).

7. Materials to be supplied by the student (see page 13 of module):
   a. two extracted teeth, suitable for sealants, mounted in plaster
   b. basic tray setup
   c. supplies for isolation
   d. curing light (if available)
   e. slow-speed handpiece, prophy brush, pumice, finishing bur or stone
   f. garmer clamps, rubber dam armamentarium or other isolation materials
   g. evacuator tips
   h. 2 x 2 gauze squares
   i. dental floss
   j. other expendable supplies as designated by the instructor

   Sealant materials (self-cure and light-cure) will be supplied by Vocational Education.

Evaluation/Grading

This course is designed on a Pass/Fail basis. In order for the student to pass the course, the requirements listed above must be successfully completed. As previously stated, the minimum percentage for acceptable sealants is 86%. All critical tasks listed on the evaluation form (identified by *) must be completed. If a critical task is not completed (in other words, a "2" is not achieved), the process evaluation is unsatisfactory and must be redone, regardless of the score. A minimum score of 75% must be achieved on the written examination. A description for determining the percentage scores is presented below.

A. Calculating Percentages for Pit and Fissure Sealants

Refer to the attached evaluation form (it is the same as the evaluation form on page 24 of the corresponding module). Each criteria is evaluated as follows:
C = Criterion met = 2 points
I = Criterion improvable = 1 point
X = Unacceptable = 0 points

Since there are 22 criteria, each worth a maximum of 2 points, there are 44 total points possible for each pit and fissure sealant. A percentage score can then be calculated by adding the total number of points earned and dividing by the total points possible (44). To facilitate calculations, the following evaluation scale is provided:

Points Achieved	Percentage	
44	100	
43	98	
42	95	
41	93	
40	91	
39	89	
38	86	Proficiency Level
37	84	
36	82	
35	79	
34	77	
33	75	
32	73	
31	70	

B. Calculating Percentages for Written Examination

For each wrong answer on the written examination subtract 4 points from 100 to determine final score.

Procedure

1. Read the self-study module, Application of Pit and Fissure Sealants.
2. Answer study questions on page 21 of module.
3. Answer objectives listed above.
4. For supplementary reading, refer to references listed on page 23 of the module.

PIT AND FISSURE SEALANT
EVALUATION FORM

Clinician________________________ Patient____________________

Date______________________________ Instructor_________________

Tooth # & surface_________________ Score______________________

Key: C = Criterion Met = 2

I = Criterion Improvable = 1

X = Unacceptable = 0

* = Critical task; if a 2 is not achieved on a critical task, the process evaluation is unsatisfactory and must be redone.

		SELF			*INSTRUCTOR*		
	TASK	C	I	X	C	I	X
1.	Instructs patient/parent about procedure and obtains consent	2	1	0	2	1	0
2.	Teeth and surfaces selected meet criteria for sealant placement.*	2	1	0	2	1	0
3.	Armamentarium is complete.	2	1	0	2	1	0
4.	Teeth are properly cleansed.*	2	1	0	2	1	0
5.	Teeth are well isolated.*	2	1	0	2	1	0
6.	Surfaces to be sealed are dried.	2	1	0	2	1	0
7.	Surfaces to be sealed are properly etched.*	2	1	0	2	1	0
8.	Conditioned (etched) teeth are rinsed well.	2	1	0	2	1	0
9.	Conditioned (etched) surfaces are dried.	2	1	0	2	1	0
10.	Sealant is mixed properly (for chemically-cured sealants)	2	1	0	2	1	0
11.	Sealant is correctly applied.	2	1	0	2	1	0
12.	Sealant is allowed to polymerize before being disturbed.	2	1	0	2	1	0

		SELF			*INSTRUCTOR*		
	TASK	**C**	**I**	**X**	**C**	**I**	**X**
13.	Area remains isolated and completely dry during entire procedure.*	2	1	0	2	1	0
14.	Excess sealant removed properly.	2	1	0	2	1	0
15.	Sealant is examined carefully with explorer tip.	2	1	0	2	1	0
16.	Sealant exhibits proper seal.*	2	1	0	2	1	0
17.	Occlusion is checked with articulating paper. Proper height and occlusion are achieved.	2	1	0	2	1	0
18.	Sealant is reapplied and polymerized as needed.	2	1	0	2	1	0
19.	Fluoride treatment is administered.*	2	1	0	2	1	0
20.	Patient is instructed about need for appropriate recall and/or reappointed for resealing.	2	1	0	2	1	0
21.	Sealants are charted and recorded accurately.	2	1	0	2	1	0
22.	Professional judgment and patient are managed appropriately.	2	1	0	2	1	0

________/44

________%

COURSE SCHEDULE

Clock Hours	Method of Instruction	Assigned Topic/Activity	Readings
2	Lecture/ Demonstration	Introduction to Course Types of fissures Retention of sealants Types of sealants -self cure -light cure Patient instructions Modes of failure Procedure -select appropriate teeth -pumice and rinse -isolate -dry and acid etch -rinse -re-isolate -dry and check for frost -apply sealant -check with explorer -check occlusion -apply fluoride	Self-study module, pp. 1-22
	Videotape	View videotape "Application of Pit and Fissure Sealants"	
5-1/2	Laboratory/ Clinical	Place sealants on extracted teeth. Place sealants on student partners. Place 4 acceptable sealants on patients (one adult and one child). *Refer to Course Requirements	
30 Minutes	Written Examination	A comprehensive written exam consisting of multiple choice and/or true/false questions.	

NOTE: The final practical examination is offered in conjunction with the Coronal Polishing final exam.

CORONAL POLISHING
PIT AND FISSURE SEALANTS
PERMISSION SLIP

This is to verify that I examined ______________________________________
(patient name)

on _____________________ and diagnosed the treatment approved below. I give my
(date)

permission for this patient to receive coronal polishing and/or pit and fissure sealants as

part of the Statewide Expanded Functions for Dental Assistants certification program.

☐ Coronal polish (check here if hard deposits have been removed and treatment is approved)

☐ Pit and Fissure Sealants (check here if teeth were radiographically and clinically examined and treatment is approved)
Please list tooth/teeth approved for sealants:

________	________
________	________
________	________
________	________
________	________

Dentist Signature_______________________________

Date____

According to Idaho State law, the application of pit and fissure sealants and coronal polishing are procedures that must be diagnosed by a dentist. Patients receiving treatment in this program must receive permission from his/her family dentist before the procedure(s) can be performed. Return this form to the course instructor.

OBJECTIVES

Following completion of lecture and laboratory/clinical activities, the student will be able to:

1. Explain why pits and fissures have a high susceptibility to caries.

2. Explain the purpose of pit and fissure sealants.

3. Describe types of sealant materials and their relative advantages, disadvantages, and properties.

4. Discuss considerations in patient and tooth selection.

5. Describe the mechanism by which the sealant attaches to the tooth.

6. List conditions that can interfere with bonding of the sealant to the tooth surface.

7. List and explain different methods used to maintain a dry field.

8. State the precautions that must be taken with regard to the following:
   a. selection of a polishing agent
   b. use of the air syringe in drying the teeth
   c. rinsing the etched tooth surface

9. Explain and demonstrate the suggested procedure for application of various types of pit and fissure sealants.

10 Evaluate the results of pit and fissure application.

11. Discuss current controversies relevant to sealant placement.

12. Describe common errors in the placement of pit and fissure sealants.

13. Discuss information that should be relayed to the patient and/or parent regarding sealant placement and subsequent recall appointments.

14. Discuss the Idaho State Board of Dentistry regulations for Idaho dental assistants with respect to applying pit and fissure sealants.

BACKGROUND INFORMATION

The term pit and fissure sealant is used to describe a resin material that is introduced into the occlusal pit and fissures of caries-susceptible teeth for the purpose of acting as a physical protective barrier against caries-producing bacteria. It has been well documented in the literature that occlusal surfaces in young patients have a high caries susceptibility. The incidence of caries is relatively low on smooth, self-cleansing surfaces (i.e., buccal, lingual, mesial, distal) where fluorides are highly effective in reducing decay. Unfortunately, fluoride is not nearly as effective in the pits and fissures where approximately 50-85% of decay is found. Bacteria are able to breed in the deep, narrow faults (fissures) where enamel did not completely form (called noncoalscence of enamel). In many cases toothbrush bristles cannot reach to the depths of these spaces to remove bacteria (see Figure 1).

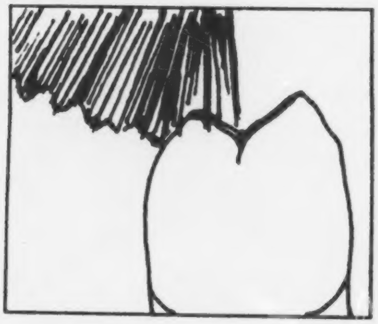

Figure 1. Many times toothbrush bristles cannot reach the depth of the pits and fissures.

Although the shape and depth of pits and fissures vary considerably even within one tooth, there are three principal types of pit and fissure configurations that have been identified: U type (wider opening), V type (narrower opening), and I type (bottleneck shape). See Figure 2a. The steeper the slope of the inclined planes of the cusps (e.g., deep, narrow pits and fissures such as the I type), the greater the chance that caries exist. Sealant materials are ideal for filling in these defects in tooth anatomy, thus preventing the passage of bacteria, food debris, and nutrients into these microscopic spaces. (see Figure 2b)

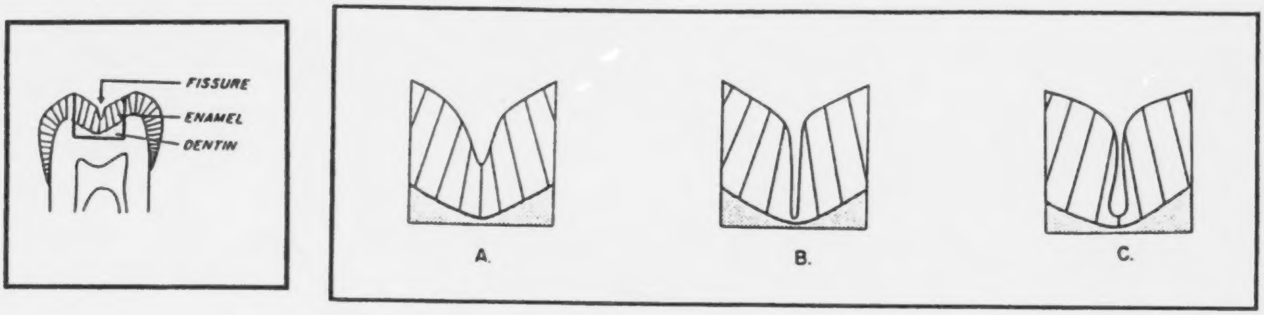

Figure 2a. Occlusal Fissures. Drawings made from microscopic slides showing variations in shape and depth of fissures. Tooth on left outlines the section that has been enlarged for A, B, and C. Drawing A: U-type wider opening. Drawing B: V-type narrower opening. Drawing C: I-type opening (bottleneck shape). (Adapted from Wilkins, EM. Clinical Practice of the Dental Hygienist, sixth edition, Lea & Febiger, 1989)

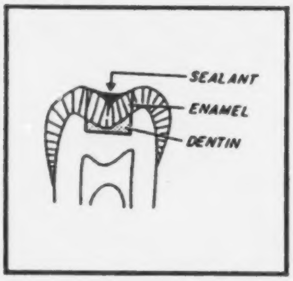

Figure 2b. Pit and Fissure Sealant. Sealant fills U-type fissure and extends part way up slopes of surrounding cusps. (Adapted from Wilkins, EM. Clinical Practice of the Dental Hygienist, sixth edition, Lea & Febiger, 1989)

Pit and fissure sealants have been found to be 99% effective in prevention of occlusal caries when the material is completely retained. *As long as the sealant material remains intact and adheres to the tooth, decay will not develop underneath it.* Retention rates (how long the sealant remains intact on the tooth) vary greatly. Studies have shown that retention rates after one year are as high as 90-100%, and then drop to 85% and 65% after three years and seven years respectively.

It has been reported that sealant retention rates are higher on newly erupted teeth rather than mature enamel, on first molars rather than second molars, and on mandibular rather than maxillary teeth. The increased retention in mandibular teeth could be due to the fact that operator access is better on the mandible, maintainance of a dry working area is easier, and gravity assists the sealant in flowing into the fissures. No difference in retention rates between light-cured and self-cured material has been documented. Clinical studies show that the majority of sealant failures are due to the operator's techniques; therefore, sealants are extremely technique sensitive.

CONSIDERATIONS IN PATIENT AND TOOTH SELECTION

Pit and fissure sealants are indicated for selected patients as part of a total preventive program. There are no explicit, foolproof, ideal criteria for selecting individuals or teeth requiring sealants. Children are most susceptible to caries and are usually the age group targeted. Sealants should be placed as soon as possible following eruption to prevent the initiation of the caries process; however, criteria should not be limited to age. The following indications and contraindications are outlined in Primary Preventive Dentistry (Harris, N, and Christen, A, 3rd edition, Appleton and Lange, 1991):

Indications - A sealant is indicated if:

1. A deep fissure, fossa, or pit is present, especially if it catches the tip of the explorer (for example, occlusal pits and fissures, buccal pits of mandibular molars, lingual pits of maxillary incisors).

Contraindications - A sealant is contraindicated if:

1. Patient behavior does not permit use of adequate dry field (isolation) techniques throughout the procedure.
2. There is an open occlusal carious lesion.
3. Caries, particularly proximal lesions, exist on other surfaces of the same tooth (radiographs must be current).
4. A large occlusal restoration is already present.

A sealant is **probably** indicated if:

1. The fossa selected for sealant placement is well isolated from another fossa with a restoration (for example, a maxillary molar with a restoration on the mesial portion of the occlusal surface).

2. The area selected is confined to a fully erupted fossa, even though the distal fossa is impossible to seal due to inadequate eruption.
3. An intact occlusal surface is present where the contralateral tooth surface i.e., same tooth surface on the other side of the arch) is carious or restored, as teeth on opposite sides of the mouth are usally equally as prone to caries.
4. There is an incipient lesion (early developing caries) in the pit and fissure; this decision would be a matter of professional judgment.

Other Considerations:

Where cost-benefit is critical and priorities must be established, ages 3-4 are most important times for sealing primary teeth, ages 6-8 for first permanent molars, and ages 11-13 for second permanent molars. These ages correspond with normal eruption patterns. Sealants should be considered for adults if there is evidence of impending caries susceptibility, for example following excessive intake of sugar, or drug-or radiation-induced xerostomia (abnormal dryness of the mouth). The *disease susceptibility of the tooth should be considered*, not the age of the individual.

Sealants are applied only after the patient has had an examination and been diagnosed by the dentist. Teeth that do not require restorations may be candidates for sealant placement. If you have any questions about the treatment plan or the tooth surfaces that have been indicated, confirm the diagnosis with the dentist.

ACID ETCHING/CONDITIONING

Sealants must form a strong mechanical bond with the enamel surface in order for the resin to be effectively retained. In its natural state, an enamel surface that has been cleaned but not otherwise treated, will not allow penetration of the sealant resin. Instead, the resin will just spread over the enamel surface. Sealant kits, therefore, are supplied with phosphoric acid etchant, which is applied to the cleansed tooth immediately prior to sealant application. Etching or "conditioning" the tooth with the phosphoric acid for one minute increases the enamel surface area by producing a selective dissolution of the enamel, opening pores into which the resin can flow. Enamel minerals are removed from the surface to a depth of approximately 25 microns. Clinically, the surface appears dull and frosted compared with the translucence of normal enamel. A sealant placed over an acid conditioned tooth penetrates into these surface irregularities created by the etchant to form resin "tags" approximately 15-25 microns in length. The tags markedly increase the mechanical retention and are responsible for clinical retention and success of the sealant (see Figure 3).

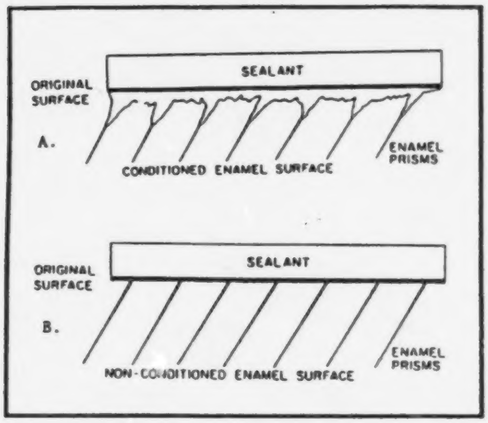

Figure 3. Enamel surface before and after acid etching. Microscopic sealant tags extend into the surface of acid conditioned enamel (A.) but do not penetrate the nonconditioned surface. Adapted from Preventing Pit and Fissure Caries: A Guide to Sealant Use. Massachusetts Health Research Institute, Massachusetts Department of Public Health, 1986.

The most critical period in the sealant application is the acid-etch process. If saliva is allowed to contact the etched tooth prior to resin placement, proteins from the saliva will adhere to the etched enamel. Upon contact with saliva, remineralization of enamel begins immediately, interfering with penetration of the sealant and significantly reducing bond strength between sealant and enamel. If a conditioned tooth becomes contaminated with saliva prior to resin placement, it should be re-etched for 20-30 seconds. Therefore, the importance of maintaining a dry field through proper isolation of the tooth cannot be overemphasized. The acid etchant should not be allowed to contact the oral soft tissues, skin or eyes at any time. If it does contact any tissue other than enamel, rinse the area with water right away. The solubility rate of etched enamel returns to that of normal enamel after a 24-hour exposure to the saliva.

The tooth must be thoroughly washed (20-30 seconds) and dried following the etching process. If this step is omitted, the presence of microscopic calcium phosphate particles, resulting from the interaction of the phosphoric acid conditioner and the enamel surface, will contaminate the prepared surface. As with saliva contamination, this form of contamination interferes with retention and can affect the clinical outcome of the sealant.

Research regarding the most effective acid concentration and the duration of application time varies considerably. Acid concentrations range from 30-70% phosphoric acid, and application times range from 10-60 seconds. Acid conditioning has been carried out for one minute in most of the published studies. Currently, the most commonly used concentration is 35-37% phosphoric acid with application time between 30-60 seconds. There is no apparent difference in the clinical performance of sealants related to the various phosphoric acid concentrations. However, because of the variability in research findings it is prudent for the clinician to follow the manufacturer's directions for acid concentration and conditioning time.

TYPES OF SEALANTS

There are numerous brands of sealant materials available from a variety of manufacturers. The most commonly used material is a liquid resin monomer (a plastic) whose base is the reaction product of three parts bisphenol A-glycidyl methacrylate (Bis-GMA) and one part methyl methacrylate (MMA). The MMA is added to decrease viscosity so it can flow into etched enamel to create a good seal. Bis-GMA is the same base material that is used in composite restorations. When used as a restorative material in the placement of tooth-colored restorations, filler particles (e.g. glass, quartz) are added for strength. Sealants usually do not require a great deal of strength since their benefit is in the depth of the pits and fissures. Sealants, therefore, are most commonly of the "unfilled" variety; i.e., the resin does not contain glass filler particles.

The main difference in types of sealant material is in the method of polymerization, or the hardening process. The two methods of polymerization are: 1) chemically-cured (also known as self-cure or autopolymerization); and 2) light-cured (also referred to as photocure, photopolymerize, or photoinitiation). Whatever system is used, finished sealants are essentially the same. The chemically polymerized sealants are packaged as two-component systems: the liquid catalyst which contains benzoyl peroxide and the liquid base, which is an organic amine. When the peroxide and amine are mixed they react chemically to polymerize in about 60 seconds. The light-cured sealants are packaged as one-paste systems that contain a photoinitiator which is activated by an intense light of specific wavelength. The light is transmitted by a rather expensive hand-held light source (see Figure 4) which affects the polymerization, usually within a 20-second period. The original light-cured resins were initiated with the use of ultraviolet light, but their use has declined with the introduction of the improved visible light-curing units and sealant materials.

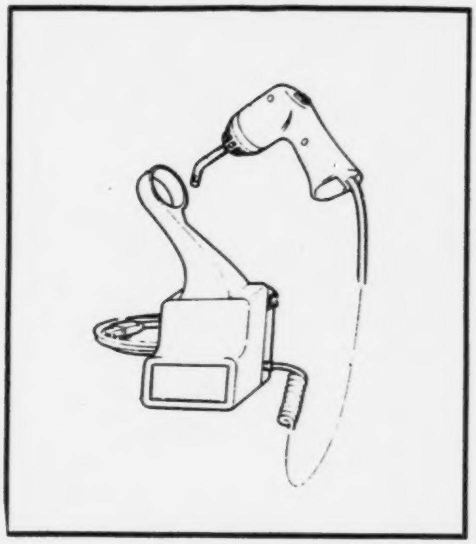

Figure 4. Visible Light Curing Unit. This hand-held light source is designed for polymerizing visible light-cure dental materials, such as pit and fissure sealants. (Taken from 3M Dental Products instruction manual)

Advantages and disadvantages of the chemically-cured and light-cured sealant systems are outlined below:

	Advantages	**Disadvantages**
Self Cure:	1. simple to use 2. less expensive -- does not require additional equipment.	1. once mixing has started, the operator must continue mixing and immediately place the sealant, or stop and make a new mix if a problem should occur. 2. the catalyst and base must be mixed prior to placement, increasing the chance of incorporating air bubbles into final product.
Light Cure:	1. operator has control over the initiation of polymerization 2. supplied as single liquid so no mixing is required	1. requires extra piece of equipment that can break down. 2. high cost of curing light 3. shorter shelf life of material

Sealants are available as clear, white, or tinted. The advantage of the opaque white or tinted sealants is the increased visibility which allows for more accurate placement during application as well as visibility during follow-up evaluations. The clear sealants are preferred by many patients because of esthetic reasons. Some clinicians opt for placing opaque sealants in the molar region and clear sealants on the premolars.

INSTRUCTIONS TO THE PATIENT OR PARENT

It is necessary to receive consent from the parent or guardian of a minor or a mentally-impaired patient prior to placing a sealant. The patient and/or parent must understand that sealants can only help prevent caries on the tooth surfaces where the sealants are applied; and that plaque control, fluoride therapy, and sugar discipline are still necessary to prevent decay on the rest of the tooth surfaces. Discuss the life expectancy (retention rate) of sealants with the patient/guardian. Use a mouth mirror whenever possible to show the patient and/or parent which tooth has been sealed. Explain that it may feel "high" immediately after placement, but that it should feel normal in one to three days through normal chewing action. If it does not, the patient should return to the dental office to have the excess height reduced.

The patient or parent should be advised to check the sealant during routine oral hygiene procedures and to contact the dental office if there is any sign of sealant loss or breakage. Inform the patient or parent of the need for six-month recall appointments to monitor sealant retention. At the recall appointment, the sealed tooth should be categorized and treated according to one of the three following categories:

Recall Status of Tooth	Treatment
All pits and fissures covered	No treatment required
Sealant missing from some or all of the pits and fissures; exposed surface sound	Reseal the exposed pits and fissures (i.e., sealant placement)
Sealant missing from some or all of the pits and fissures; caries present	Restore carious pits and fissures (i.e., restorative procedures by the DDS)

Adapted from Preventing Pit and Fissure Caries: A Guide to Sealant Use. Massachusetts Health Research Institute, Massachusetts Department of Public Health, 1986.

SEALANT FAILURE

The success of sealants is dependent upon a strong sealant-to-enamel bond, with sufficient mechanical retention being the primary determinant of clinical success. Improper technique is the major cause of failure or early loss of sealants; therefore, it is imperative that the operator strictly adhere to proper sealant placement. The following list describes common technique errors.

1. *Contamination* may be caused by either saliva or calcium phosphate products as described earlier. The enamel surface must be re-etched if contaminated.

2. *Inadequate surface preparation* may be caused by improper cleansing prior to applying the etchant and/or the etching process itself.

3. *Incomplete or slow mixing* of self-cure sealants affects polymerization of the Bis-GMA material. If polymerization is negatively affected (e.g., starts to set-up before placement), a new mix should be made.

4. *Too slow application of the material* results in a less viscous (thicker) mix that cannot flow easily into the pits and fissures, causing an incomplete seal. Place material within the time frame recommended by the manufacturer.

5. *Air entrapment due to whipping or vigorous mixing* can occur during the mixing of self-cured sealants. It is important to replace the caps on the resin bottles since moisture can be lost through evaporation. The result is a less viscous material which does not flow properly.

6. *Over-extension of the material beyond the conditioned tooth surface* results in a weakened sealant in the areas that are over extended. If the sealant margins extend beyond etched tooth structure, those areas will cause increased microleakage beneath the sealant and/or fracture of the sealant. The sealant should be replaced, confining the area of placement to etched tooth structure.

PLACEMENT PROCEDURE

This section of the module will introduce the application of pit and fissure sealants in 10 steps. If these 10 steps are followed correctly, you should have a high success rate in the sealants you apply. The following armamentarium is needed for this procedure:

mouth mirror, explorer, cotton pliers/forceps
2 sets of garmer clamps, or other armamentarium for maintaining a dry field
gauze
flour of pumice
cotton pellets
evacuator tips (saliva ejector and high speed)
sealant dappen dish
sealant material:
- universal and catalyst (for self-cure)
- universal resin (for light-cure)

light curing unit (for light-cure)

cotton rolls (short and long)
prophy brush
slow speed handpiece
floss
air/water syringe tip
sealant applicator
acid etch
acid etch brush

STEP 1. SELECT APPROPRIATE TEETH

Sealants are not for all caries-free pits and fissures. Teeth should be evaluated in terms of:

1. overall caries susceptibility
2. existing restorations and carious lesions
3. occlusal anatomy

Sealants should be applied to teeth with caries-free occlusal surfaces, to teeth with deep pits and fissures, to teeth with no proximal decay, and to newly-erupted teeth. Sealants should not be applied to teeth in the mouth with rampant interproximal decay, or to teeth with shallow, well-coalesced pits and fissures in a mouth that shows no existing restorations or carious lesions. Sealants are placed only after a thorough examination, including radiographic evaluation, and subsequent diagnosis by the dentist.

Patients who will most often need sealants are children ages 6-13 who exhibit newly-erupted 6-year molars, permanent premolars, or 12-year molars. Partially-erupted teeth may be sealed provided there is no tissue flap over the occlusal surface to interfere with application. Premolars and primary molars may be sealed as well as newly-erupting 3rd molars. It is necessary to receive consent from the parent or guardian of a minor or a mentally-impaired patient prior to placing a sealant.

STEP 2. PUMICE OCCLUSAL SURFACE AND RINSE

Flour of pumice applied with a rotary brush works well for cleansing the tooth surface of debris. It is important that there be no oil and no fluoride present in the cleaning agent. Both interfere with the etching process. Therefore, commercial prophy pastes are not recommended for cleansing prior to sealant placement. After polishing the tooth surface to be sealed, rinse the tooth well with water to remove the pumice.

Many operators advocate the use of hydrogen peroxide or the Prophy Jet® rather than pumice for optimal plaque removal. Since all three methods will effectively remove plaque if properly performed, the clinician should defer to office policy or personal preference when selecting which method to use. However, Idaho dental assistants currently are not permitted by law to use the Prophy Jet®.

STEP 3. REMOVE PUMICE FROM GROOVE WITH EXPLORER

Pumice particles may become wedged in deep pits and fissures. Check all pits with explorer to be sure any remaining pumice or plaque has been removed. Sometimes it is impossible to remove all the stain from the pits. In this case, you may seal over the stain. Rinse again after removing all plaque and/or pumice.

STEP 4. ISOLATE

There are several ways to isolate the teeth. Rubber dam isolation is ideal but cotton roll isolation is most commonly used. For maximum results, it is suggested that you isolate both maxillary and mandibular quadrants for each sealant application.

Garmer clamps (demonstrated in the videotape which accompanies this module) are very effective in maintaining a dry field. With these clamps, a long cotton roll may be placed in the mandibular vestibule and wrapped in a horseshoe-shape fashion to extend to the maxillary vestibule thus isolating the maxillary and mandibular teeth of the same side at the same time. This way the mandibular teeth are sealed first--then the maxillary teeth, so that an entire side of the mouth is sealed all at once. A garmer clamp also may be used with two short cotton rolls for isolation of the mandibular teeth. The maxillary teeth may then be isolated with either a gauze square or a single cotton roll. Other methods of isolation include the placement of saliva absorbers (for example, Lorvic's dri-aids®) over the parotid ducts (salivary openings on the inner cheek) next to maxillary molars, or the use of small plastic cotton roll holders. These techniques might be useful in cases where patient management is not a problem or salivary flow is minimal.

Isolation technique is extremely important in the success of the sealant. Saliva contamination of an etched tooth will interfere with sealant retention. If there is difficulty retaining a sealant, a rubber dam should be considered when reapplying the sealant. You may also want to consider the use of bite blocks to keep the patient's mouth open during the procedure.

STEP 5. DRY AND ETCH

Thoroughly dry the tooth (30 seconds) to prevent dilution of the acid etch solution. Check the air line to make certain it is free of oil prior to drying the tooth because oil and moisture will interfere with sealant bonding. To check the air line, blow air from the air syringe onto the surface of the mouth mirror until there is no trace of oil or moisture.

Apply etchant solution with the acid-etch brush which is packaged with in sealant kit or a cotton pellet. Place the etchant 2/3 up the cuspal slopes using a gentle dabbing motion. A rubbing motion will break the fragile enamel lattice work formed during the etching process. Review the manufacturer's instructions for proper etching time for the sealant material you are using. Usual etching time for permanent teeth is 60 seconds. If using acid gel, let it set untouched for the recommended time period (usually 60 seconds). Do not allow the etchant to contact the oral mucosa, skin or eyes. If it does, thoroughly rinse the area with water.

The acid should be applied over an area that is 2-3 millimeters beyond the area to be sealed (see Figure 5). It is critical that sealant margins end within the etched enamel area to prevent microleakage. If the sealant margin ends on untreated enamel, it will be weak, fracture away easily, or allow bacteria to lodge under the margin. Deciduous teeth should be etched for 1 1/2-2 minutes and fluorosed teeth (teeth that have been stained or pitted due to excessive fluoride during formation) should be etched for 15 seconds longer than the regular time

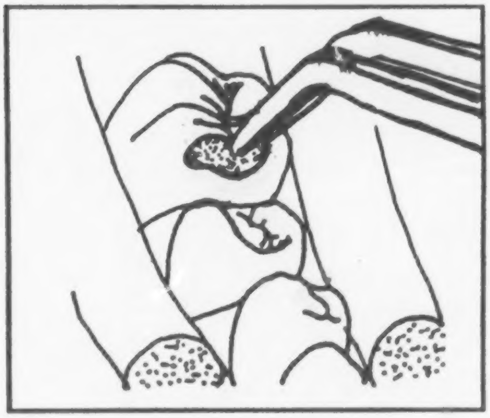

Figure 5. Apply acid etch 2-3 millimeters beyond area to be sealed. In this example, cotton roll isolation is being used to maintain a dry field, which is critical to the success of sealant retention.

STEP 6. RINSE 20-30 SECONDS

Suction excess acid from the tooth surface first. Then rinse the tooth with water, holding the evacuator tip close to the tooth to suction remaining acid and water. Rinsing for the full 20-30 seconds is crucial in removing surface by-products of etching which interfere with sealant retention.

STEP 7. RE-ISOLATE

Cotton rolls will become saturated during rinsing so they need to be changed. A second set of loaded Garmer clamps may be used to simplify changing to dry cotton rolls. If this method is used, place a dry cotton roll over the etched surface to prevent saliva contamination during the switch. This is the most vulnerable time for saliva contamination of the etched enamel to occur. If is does occur, re-etch the tooth surface for 30 seconds.

Sometimes it is possible to place dry cotton rolls over the saturated ones without changing the saturated cotton rolls. These dry cotton rolls must be held in place.

STEP 8. DRY 20 SECONDS -- CHECK ETCHED SURFACE

The tooth must be completely dry before placing the sealant or it will not be retained. Once again, make certain that the air line is not contaminated with oil or water. The etched surface should be a dull, chalky white. If the tooth does not appear frosty white, etch again for 15-30 seconds.

STEP 9. APPLY SEALANT IN 30 SECONDS

Self-cured or Autopolymerized sealants:

Have the sealant ready to dispense quickly. Add 1 drop of catalyst to 1 drop of universal. Mix for 5 seconds. You will have 30 seconds to apply the sealant. A brush or a small disposable tube (cannula) as provided by the sealant kit may be used. Immerse the tip of the tube in the sealant mix and release the lever. The applicator will draw up an amount suitable for an occlusal surface (Figure 6).

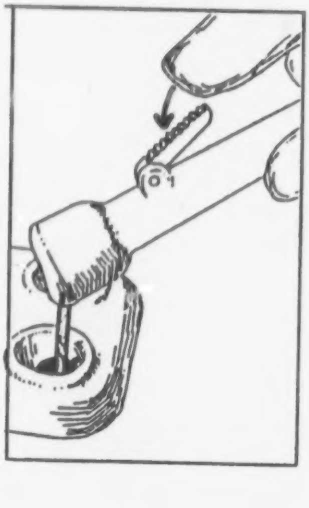

Figure 6. Immerse tip of disposable tube in bottom of plastic mixing well and release lever to draw resin up into tip.

Apply sealant in a relatively thick layer extending approximately 2/3 up the cuspal slope. Touch the applicator to a mesial inclined plane, depress lever gradually, and allow it to flow into the fissures toward the distal (see Figure 7). If the sealant is chemically polymerized, it will set up in 1-3 minutes. Check the leftover mixture in the plastic mixing well to see if it is hardened. If so, the tooth may now be checked for polymerization as well. There will always be a greasy film, called the air-inhibited layer, left on the top surface of the sealant. This should be wiped off with a cotton pellet or rinsed off with water.

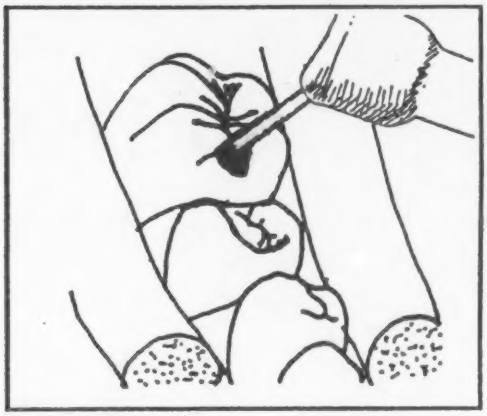

Figure 7. Placing sealant material.

Light-cured or Photopolymerized Sealants:
Dispense 1-2 drops of sealant material into the mixing well that is provided with the sealant kit (2 drops is sufficient quantity for one quadrant). There is no need to mix light-cured sealant. Apply the material in the same manner as explained above for self-cured material with the small disposable tube/applicator..

After the material has been placed, initiate polymerization with the light source. Expose all coated surfaces for 20 seconds, keeping the light guide about 1-2 millimeters from the surface. Touching the light tip to the uncured sealant will coat it with material and prevent accurate light emission. The curing light must expose the entire coated surface; therefore; if the surface to be sealed is larger than the light guide, the light must be moved across the surface, curing each tip-sized area. It is strongly recommended that you use some means of available protective eyewear (special glasses or shields) that filter out the bright light. After the sealant has set, rinse or wipe the occlusal surface (air-inhibited layer).

STEP 10. CHECK APPLICATION WITH EXPLORER

All margins should be checked to make sure that they are flush with the tooth and that application was successful (see Figure 8). Move the tip of the explorer back and forth across the margins and try to "pry" the sealant away from the enamel. If there are any voids or air bubbles, or if complete coverage is not attained, additional sealant can be added without re-etching if a dry field has been maintained. If saliva was allowed to contaminate the surface or the sealant does not adhere, the procedure should be repeated, re-etching for 15-30 seconds. Since all the BIS-GMA products are of the same chemical family, they will easily bond to each other.

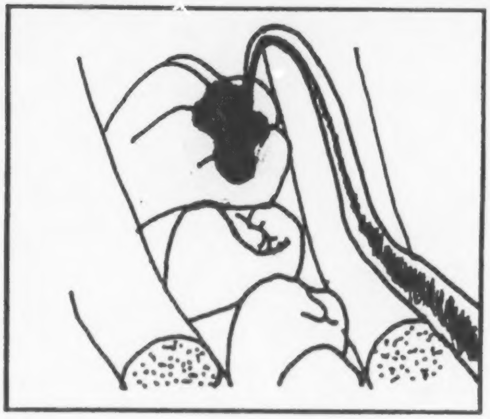

Figure 8. Check all margins with explorer.

Remove the cotton rolls or rubber dam. The gingival 1/3 of the tooth should be checked for excess sealant that may have spilled over during placement . If there is a small excess amount, you may flick it off with an explorer. Contacts should be checked also. Floss on each side of the sealed teeth to make sure contacts were not sealed closed. If they were, remove excess with an explorer. Occlusion must be checked before dismissing patient. Articulating paper is used to identify high spots. Dry teeth thoroughly and have patient tap teeth together and slide mandible from side to side. If it is excessively high, there will be heavy dark markings on the sealants which should be polished down with a finishing bur. If it is just slightly high (smaller dark markings), inform patient that these areas will wear down in 2-3 days. Apply fluoride to the sealed tooth to cover any etched but unsealed areas of the tooth. Let the patient know that sealants should be checked every 6 months to assure that they have been completely retained. Sealants are charted on the patient's dental charting and an entry made in the record of services.

A summary of the steps for sealant application follows:

1. select appropriate teeth according to the dentist's diagnosis and criteria for selection
2. pumice and rinse
3. remove pumice from grooves with explorer and rinse
4. isolate teeth to be sealed
5. dry and etch 60 for seconds
6. rinse for 20-30 seconds
7. re-isolate
8. dry for 20 seconds - check etched surface
9. apply sealant: if using self-cured material, place within 30 seconds of mixing; if using light-cured, place material and expose the entire surface with the curing light for recommended time.
10. check application with explorer and floss

NOTE: Do not dismiss patient until occlusion has been checked and fluoride has been applied to the sealed tooth/teeth.

The application of pit and fissure sealants is one of the most valuable preventive procedures that can be provided for patients. They are part of a total preventive program which also includes fluoride, oral hygiene, diet control, and regular checkups. Good oral hygiene is essential to prevent caries on the tooth surfaces where sealants have not been applied. Sealants should be checked by patients during routine homecare procedures for loss or breakage, and should be replaced when indicated. Recall appointments should be scheduled every six months to monitor sealant retention.

STUDY QUESTIONS

Directions: Answer the following questions on a separate piece of paper to the best of your ability. You may use the module to look up needed information. Upon completion of the questions, review all responses to familiarize yourself with pertinent information.

1. What is a pit and fissure sealant?
2. What is the purpose of pit and fissure sealants?
3. Why are pits and fissures more susceptible to caries than the smooth tooth surfaces?
4. Describe the three principle pit and fissure configurations, indicating which type is most susceptible to caries.
5. How effective are sealants?
6. Retention rates vary greatly and, to some extent, are impacted by the teeth on which they have been placed. Which teeth have high retention rates?
7. When are sealants indicated for placement?
8. When are sealants contraindicated for placement?
9. What factors should be considered for possible sealant placement?
10. By what means does the sealant attach to the tooth?
11. How does the acid etch increase the bonding ability of the sealant material?
12. What are two types of contamination that can interfere with retention and affect the outcome of the sealant?
13. What type of acid is most commonly used to etch or condition the tooth prior to sealant placement?
14. How long should the acid etch remain on the tooth prior to rinsing?
15. Describe the clinical appearance of properly etched enamel.

16. What are the initials of the liquid resin that is commonly used as a sealant material?

17. Are sealants more commonly of the filled variety or the unfilled variety?

18. What is the difference between filled and unfilled resin?

19. Explain the differences and similarities between light-cured and chemically-cured sealants.

20. What are the advantages and disadvantages of the light-cured and chemically-cured sealant systems?

21. What instructions should be given to the patient and/or parent regarding pit and fissure sealants?

22. Clinical studies show that the majority of sealant failures are due to the operator's technique. What are six common technique errors?

23. What considerations should be given to selection of a polishing/cleansing agent?

24. What methods are effective for establishing a dry field of operation?

25. Why is an explorer used in the pits and fissures after the tooth has been polished/cleansed with pumice?

26. How and where should the etchant be applied for:
    -etchant solution (liquid)?
    -etchant gel?

27. How should the resin be applied for:
    self-cured sealant?
    for light-cured sealant?

28. How should the air-inhibited (non-polymerized) layer be removed?

29. If additional sealant resin must be added because of voids or incomplete coverage, how should it be accomplished?

30. How is the occlusion checked and adjusted if necessary?

REFERENCES

Craig, R.G., editor, Restorative Dental Materials, eighth edition, the C.V. Mosby Company, 1989.

Dietz, E.R., Pit and fissure sealants, Dent. Assist., Nov./Dec. 1988.

Harris, N.O., and Christen, A.G. Primary Preventive Dentistry, third edition. Appleton & Lange, 1991.

Massachusetts Health Research Institute. Preventing pit and fissure caries: A guide to sealant use. Massachusetts Department of Public Health, 1986.

Mertz-Fairhurst, E.J., Fairhurst, C.W., Williams, J.E., et al. A comparative clinical study of two pit and fissure sealants: Six year results in Augusta, Ga. J. Amer. Dent. Assn., 105, 1982.

National Institutes of Health, Consensus development conference statement on dental sealants in the prevention of tooth decay, J.A.D.A., Vol. 108, No. 2, Feb. 1984.

National Institute of Dental Research, Conference proceedings: Dental sealants in the prevention of tooth decay, J. Dent. Ed., Vol. 48, No. 2 (Supplement) Feb. 1984.

Silverstone, L.M., The current status of adhesive sealants, Dent. Hyg., Vol. 57, No. 5, May 1983.

Simonsen, R.J., Five-year results of sealant effects on prevalence and treatment costs. J. Dent. Res., 61, 1982.

Straffon, L.H., More, F.G., and Dennison, J.B. Three year clinical evaluation of sealant applied under rubber dam isolation. J. Dent. Res., 63, 1984.

United States Department of Health and Human Services. Dental treatment needs of United States children, 1979-1980. The national caries prevalence survey. N.I.H. Publication No, 83-2246, December.

Woodall, I.R., Dafoe, B.R., Young, N.S., Weed-Fonner, L., Yankell, S.L. Comprehensive Dental Hygiene Care, second edition. The C.V. Mosby Company, 1985.

Wilkins, E.M. Clinical Practice of the Dental Hygienists, sixth edition. Lea & Febiger, 1989.

PIT AND FISSURE SEALANT
EVALUATION FORM

Clinician________________________ Patient______________________

Date____________________________ Instructor____________________

Tooth # & surface__________________ Score________________________

Key: C = Criterion Met = 2
I = Criterion Improvable = 1
X = Unacceptable = 0
* = Critical task; if a 2 is not achieved on a critical task, the process evaluation is unsatisfactory and must be redone.

		SELF			*INSTRUCTOR*		
	TASK	**C**	**I**	**X**	**C**	**I**	**X**
1.	Instructs patient/parent about procedure and obtains consent	2	1	0	2	1	0
2.	Teeth and surfaces selected meet criteria for sealant placement.*	2	1	0	2	1	0
3.	Armamentarium is complete.	2	1	0	2	1	0
4.	Teeth are properly cleansed.*	2	1	0	2	1	0
5.	Teeth are well isolated.*	2	1	0	2	1	0
6.	Surfaces to be sealed are dried.	2	1	0	2	1	0
7.	Surfaces to be sealed are properly etched.*	2	1	0	2	1	0
8.	Conditioned (etched) teeth are rinsed well.	2	1	0	2	1	0
9.	Conditioned (etched) surfaces are dried.	2	1	0	2	1	0
10.	Sealant is mixed properly (for chemically-cured sealants)	2	1	0	2	1	0
11.	Sealant is correctly applied.	2	1	0	2	1	0

12.	Sealant is allowed to polymerize before being disturbed.	2	1	0	2	1	0
			SELF			*INSTRUCTOR*	
	TASK	**C**	**I**	**X**	**C**	**I**	**X**
13.	Area remains isolated and completely dry during entire procedure.*	2	1	0	2	1	0
14.	Excess sealant removed properly.	2	1	0	2	1	0
15.	Sealant is examined carefully with explorer tip.	2	1	0	2	1	0
16.	Sealant exhibits proper seal.*	2	1	0	2	1	0
17.	Occlusion is checked with articulating paper. Proper height and occlusion are achieved.	2	1	0	2	1	0
18.	Sealant is reapplied and polymerized as needed.	2	1	0	2	1	0
19.	Fluoride treatment is administered.*	2	1	0	2	1	0
20.	Patient is instructed about need for appropriate recall and/or reappointed for resealing.	2	1	0	2	1	0
21.	Sealants are charted and recorded accurately.	2	1	0	2	1	0
22.	Professional judgment and patient are managed appropriately.	2	1	0	2	1	0

________/44

________%

Module 2-B

APPLICATION OF PIT AND FISSURE SEALANTS

Final Examination

Name______________________

Grade_____________________

PIT AND FISSURE SEALANTS
WRITTEN EXAMINATION

Directions: Circle the best answer to the questions below.

1. Pit and fissure sealants are intended to:
    a. trap bacteria in the tooth to increase caries production
    b. prevent caries-producing bacteria from entering the tooth
    c. eliminate caries-producing bacteria

2. As long as sealant remains intact, and properly adheres to the tooth surface, decay will not develop beneath it.
    a. true
    b. false

3. Sealant retention rates are higher on:
    a. newly-erupted teeth rather than mature enamel
    b. second molars rather than first molars
    c. maxillary rather than mandibular teeth

4. Clinical studies show that light-cured sealants have a much higher rate of retention than self-cured sealants.
    a. true
    b. false

5. A pit and fissure sealant is indicated for placement on a tooth if
    a. a faulty restoration is present
    b. a deep occlusal fossa is present
    c. a large occlusal carious lesion is present
    d. caries exist on adjacent surfaces of the tooth

6. Which of the following teeth is a candidate for a pit and fissure sealant in a 12 year old patient:
    a. first permanent mandibular molar with a proximal caries on the mesial
    b. maxillary central incisor which is caries free with a deep lingual pit
    c. first permanent premolar with caries on the distal
    d. second permanent molar with a composite on the occlusal

7. Sealants must form a stong chemical bond with the enamel surface in order for the resin to be retained.
    a. true
    b. false

8. The primary reason for etching enamel before placing a sealant is to
   a. create surface irregularities to increase the area for retention
   b. form a smooth surface to enhance flow of the sealant
   c. create a chemical reaction with enamel to evaporate saliva

9. If saliva contacts an etched surface before sealing:
   a. the retentive ability will be increased
   b. the enamel may remineralize
   c. the patient must be reappointed

10. When an acid etch is used in preparation for a pit and fissure sealant, the most effective etch is achieved using
    a. boric acid
    b. acetic acid
    c. citric acid
    d. phosphoric acid
    e. hydrochloric acid

11. To prepare a clean surface of a permanent tooth for a sealant, the surface should be etched for
    a. 10 seconds
    b. 60 seconds
    c. 90 seconds
    d. check manufacturer's instructions
    e. b and d

12. A properly etched tooth will appear
    a. chalky
    b. dull
    c. frosty
    d. glossy
    e. a, b, and c
    f. all of the above

13. Most sealants used today are
    a. methyl glycidyl methacrylate
    b. methyl methacrylate
    c. bisphenol A glycidal methacrylate and methyl methacrylate

14. The accepted methods of polymerizing pit and fissure sealants are:
    a. autopolymerization
    b. photopolymerization
    c. monomerpolymerization
    d. a and b
    e. a, b, and c

15. If correctly used, cotton rolls can be as effective as a rubber dam in maintaining a dry field in sealant placement.
    a. true
    b. false

16. The main advantage of using the light-cured resins is:
    a. decreased cost
    b. simplified isolation technique
    c. control of polymerization time
    d. shortened shelf life
    e. increased capacity for bonding

17. The single greatest reason for sealant failure is:
    a. topical fluoride
    b. operator error in technique
    c. acidity of the saliva
    d. none of the above

18. The correct type of hand movement to use when applying etching solution on a tooth in preparation for a dental sealant is
    a. gentle dabbing
    b. gentle rubbing
    c. vigorous rubbing
    d. vigorous brushing

19. After polymerization with curing light, which of the following should be done to the residual film of unpolymerized sealant in order to complete the procedures accurately?
    a. repolymerize the surface for 10 seconds
    b. wash the surface film off
    c. wipe the unpolymerized film away with a cotton pledget
    d. b or c

20. More sealant may be added to the tooth when
    1. a void is found
    2. coverage of pits and fissures is incomplete
    3. the tooth remains uncontaminated.

    ANSWER:
    a. 1 only
    b. 2 only
    c. 1, 2, and 3

21. A patient presents to your office for an examination in which you find that a sealant is faulty. Steps in caring for this patient would include which of the following:
    a. re-etch over the faulty sealant and reapply sealant material
    b. remove as much of the faulty sealant as possible, re-etch and reapply the sealant material
    c. re-etching is not necessary, reapply the sealant material
    d. sealants cannot be replaced after a prolonged period of time

22. Which of the following are indicated after placing an enamel sealant?
    1. Examine for occlusal interference
    2. Assess retention of the sealant
    3. Examine for voids and irregularities
    4. Advise the patient not to chew on the side of the sealant for 24 hours

ANSWER:
    a. 1, 2, 3
    b. 1, 2, 4
    c. 2 and 3 only
    d. 2, 3, and 4

23. When the unfilled sealant is polymerized, how should major occlusal discrepancies (heavy dark markings with articulating paper) be removed?
    a. finishing bur
    b. pumice
    c. finishing strip
    d. natural abrasion

24. When the unfilled sealant is polymernized, how should minor occlusal discrepancies (small dark markings with articulating paper) be removed?
    a. finishing bur
    b. pumice
    c. finishing strip
    d. natural abrasion

25. It is not necessary to inform the parent about a newly placed sealant since they are usually clear and cannot be easily detected by the parent or patient anyway.
    a. true
    b. false

ANSWER KEY FOR PIT AND FISSURE SEALANTS WRITTEN EXAMINATION

1. b
2. a
3. a
4. b
5. b
6. b
7. b
8. a
9. b
10. d
11. e
12. e
13. c
14. d
15. a
16. c
17. b
18. a
19. d
20. c
21. b
22. a
23. a
24. d
25. b

Module 3

TEMPORARY CROWN RESTORATIONS

Module 3-A

TEMPORARY CROWN RESTORATIONS

Instructor's Guide

PLACING TEMPORARY CROWNS

INSTRUCTOR'S GUIDE

Developed by

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Boise, Idaho

1991

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PLACING TEMPORARY CROWNS

INSTRUCTOR'S GUIDE

This course is designed for the currently employed dental assistant (at least six months) that has successfully completed the Fundamentals of Dental Assisting Course as stated in the Regulations of the Idaho State Board of Dentistry. Section 10. c.ii. The course is intended to be taught separately or in combination with one or all of the other expanded functions courses according to the needs of the students enrolled in the program.

The goal of the course is to provide the dental assistant with the background knowledge and necessary skills in placement of temporary crowns under the direct supervision of a dentist.

Upon successful completion of the course, the student will receive a certificate of completion/recognition to perform this function.

The required text for this course is Temporary Crown Restorations. The original text was developed by Project ACCORDE but has been revised and updated by LuAnn Spain, C.D.A. (1991). Suggested reading material is listed at the end of Module 5.

Clock Hours

Lecture/Demonstration	5 1/2 Hours
Laboratory	12 Hours
Written Examination	30 Minutes
Final Practical Examination	2 1/2 Hours

Course Requirements

For successful completion of the course, each participant must complete the following requirements:

1. Attend all class and laboratory sessions.
2. Place two (2) acceptable preformed aluminum crowns.
3. Place two (2) acceptable preformed polycarbonate crowns.
4. Place two (2) acceptable custom acrylic crowns.

After completing the practice for each temporary crown, it should be feasible for the student to complete a temporary crown in less time. The suggested time for practice of an aluminum temporary crown is: 55 minutes, first trial; 30 minutes, second trial.

The suggested time for practice of polycarbonate temporary crowns is: 1 hour, first trial; 40 minutes, second trial.

The suggested time for practice of custom acrylic temporary crowns is: 2 hours, first trial; 1 hour, second trial.

Materials and Supplies

Each student enrolled in the course will be provided with the necessary Columbia Model #860 dentiform. These dentiforms are available at each of the area vocational-technical schools. The specified teeth to accompany the dentiform will also be provided by the school. These teeth include:

#18 full coverage preparation for aluminum crown
#14 full coverage preparation for custom acrylic crown
#8 full coverage preparation for polycarbonate crown

It will be the student's responsibility to provide the necessary armamentarium which is listed at the beginning of each module. The students are required to supply their own slow-speed handpiece with a straight sleeve.

It is recommended that the instructor have study models of the temporary crowns for the student to evaluate. The instructor will need two study models of each type of temporary: one meeting all criteria and one with sample deficiencies. The deficiencies suggested for the second study model follow:

1) The study model for aluminum temporary crown #18 will have the following deficiencies:

   Distal - crown extends beyond the finish line
   Lingual - crown margin is 0.8 mm short of the finish line
   Facial - insufficient crimping at margin

2) The study model for polycarbonate temporary crown #8 will have the following deficiencies:

   Lingual - heavily over contoured
   Incisal - trimmed to stub without polishing; incisal edge is too long
   Facial - undercontoured in gingival third and pitted.

3) The study model for custom temporary crown #14 will have the following deficiencies:

Custom temporary #14 - uneven occlusal surface from distortion during polymerization

The necessary criteria and deficiencies for each temporary crown study model is listed in the Practice section of the text for the students to review.

The videotapes that accompany the aluminum and polycarbonate modules are from the original Project ACCORDE course; they are outdated according to the proper asepsis techniques. The instructor is encouraged to stress the importance of proper asepsis techniques as stated in the course. The video's still have valuable content for the fabrication of aluminum and polycarbonate crowns, although they are in black and white. The instructor should show the videotapes to students immediately after lecture and prior to the laboratory activity.

The videotape for custom temporary crowns was developed by Gordon J. Christensen entitled "Simple Temporary Restorations for Fixed Prosthodontics." This video describes all aspects of temporary crowns with emphasis being placed on the custom temporary crowns. The videotape will demonstrate the various techniques available in the fabrication of temporary crowns.

Gordon J. Christensen's videotape can be purchased from:

Practical Clinical Courses
3707 North Canyon Road, Suite 3D
Provo, UT 84604
(801) 226-6569

TESTING PROCEDURES FOR FINAL PRACTICAL EXAMINATION

This course is designed on a Pass/Fail basis. In order for the student to pass the course, the requirements listed on the course outline must be successfully completed.

A short written examination (approximately 30 minutes) is provided and should be administered at the conclusion of the course. A copy of the written, final examination and the answer key are provided. A minimum of 75% must be achieved on the written examination. The examination is worth a total of 100 points possible: 4 points for each multiple choice question and 2 points for each true/false question. For each incorrect multiple choice question, subtract 4 points and for each incorrect true/false question, subtract 2 points from the total of 100 points to determine the final grade.

Prior to the final practice examination, a date should be scheduled for the examiners (evaluators). Time and date for the final practical examination should be at the discretion of the instructor and/or examiners, after completion of all course requirements.

Two examiners will grade the final temporary crown restoration. The examiners will include:

1) The area dentist(s) or standardized examiner designated by the Idaho State Board of Dentistry.

2) The primary course instructor.

The final practical examination on temporary crown restorations will be timed as follows:

1) The time allotted for the aluminum temporary crown during the final practical examination is thirty minutes.

2) The time allotted for the polycarbonate temporary crown during the final practical examination is forty-five minutes.

3) The time allotted for the custom acrylic temporary crown during the final practical examination is one hour.

The final practical exam on temporary crown restorations will be based on a percentage grade. The student must achieve a minimum score of 85% on each temporary crown to successfully pass the course.

The temporary crown restoration will be evaluated by two examiners (evaluators). If an error is noted on the evaluation form by one examiner, it must be noted in the same areas on the second evaluator's form. Only when the two examiners agree on the same error will it be considered "valid". Only valid errors will be considered when calculating the final percentage grade. If a third opinion is needed or a question should arise concerning the temporary crown restoration, a third examiner should be consulted. It may also be necessary to require a third examiner when the final percentage grade is in question.

Calculating Percentages for Temporary Crowns

Refer to the attached evaluation forms. Each criteria is evaluated as follows:

2 = Acceptable
1 = Improvable
0 = Unacceptable

Points are assigned to each of the above as follows:

2 = 2 Points
1 = 1 Point
0 = 0 Points

For aluminum crowns, there are 7 criteria, each worth a maximum of 2 points for a total of 14 points possible. For the polycarbonate and custom acrylic crowns, the evaluation forms list 10 criteria, again worth a maximum of 2 points each for a total of 20 points possible. A percentage score can then be calculated by adding the total number of points earned and dividing by the total points possible (either 14 or 20).

To facilitate calculations, the following calculations scale is provided:

Preformed Aluminum Crowns

Points Achieved	Percentage	
14	100	
13	92.8	
12	85.7	Proficiency Level
11	78.5	
10	71.4	
9	64.2	

Preformed Polycarbonate/Custom Acrylic Crowns

Points Achieved	Percentage	
20	100	
19	95	
18	90	
17	85	Proficiency Level
16	80	
15	75	
14	70	
13	65	

The final examination of the students should not be discussed among the examiners. Anonymity of students must be maintained throughout the testing session. Students are assigned a number to be used in lieu of their names during the examination. A course instructor should keep a list of students' names and corresponding numbers until the examination is completed.

Verification of Completion

Students successfully completing the course will receive a certificate verifying completion from the appropriate area Vocational-Technical School. Should a student fail the course, the student may be retested or repeat the course. Instructors should check with the Vocational-Technical School for current State Board of Dentistry policies on re-examination.

Module 3-B

TEMPORARY CROWN RESTORATIONS

Final Examination

TEMPORARY CROWNS
WRITTEN FINAL EXAMINATION

Name:______________________________ Date:_____________

Grade:_____________

MULTIPLE CHOICE (4 points each): CIRCLE THE BEST ANSWER TO THE QUESTIONS BELOW.

1. Why are temporary crowns placed?

    1. to preserve the tooth until an amalgam restoration can be placed
    2. to maintain occlusion
    3. to protect dentin from oral fluids
    4. to protect sensitivity in a prepared tooth

    Answer:
    - a. all of the above
    - b. 1, 2 and 3
    - c. 1, 2 and 4
    - d. 2, 3 and 4

2. What is the chief disadvantage of an aluminum crown?

    - a. malleability
    - b. expense
    - c. softness
    - d. poor aesthetic quality

3. On what teeth are custom acrylic resin crowns used?

    - a. only on molars and premolars
    - b. only on teeth in the mandibular arch
    - c. only on anterior teeth
    - d. on any tooth in the mouth

4. What should be done if the margin of a preformed aluminum crown is short of the finish line?

    - a. the crown can be altered with contouring pliers to make it fit
    - b. the finish line can be adjusted
    - c. another crown must be selected

5. What should be done if an aluminum crown is slightly small and lacks adequate contact?

   a. a larger crown must be selected since the metal cannot be stretched
   b. nothing should be done because it is better to be too small than too large
   c. a ball burnisher can be used to increase the size slightly to achieve contact.

6. Which of the following types of temporary crowns have superior fit and external contours?

   a. the preformed polycarbonate crown
   b. the custom acrylic crown
   c. the preformed aluminum crown
   d. the cellulose crown form

7. When occlusal patterns are examined, what does a marking on every tooth except the crown restoration indicate?

   a. the crown is in supraocclusion
   b. the crown is in infraocclusion
   c. the crown is in the ideal position

8. Why is it important to thoroughly mix the monomer (liquid portion) with the polymer (powder portion) when constructing a polycarbonate crown?

   a. exothermic reaction must be avoided
   b. the monomer in its pure form is toxic to the tooth
   c. exact proportions must be maintained
   d. the polymer in its pure form is toxic to the tooth

9. Which measurement is a major consideration in determining which size crown to use?

   a. facial-lingual
   b. mesial-distal
   c. occlusal-gingival

10. When mixed, the polymer and the monomer of resin polymerize producing heat; this is known as which of the following reactions?

   a. polythermic
   b. endothermic
   c. hypothermic
   d. exothermic

11. Select the best order of use for trimming and polishing custom acrylic resin or polycarbonate crowns.

1. carbide acrylic bur
2. fine pumice
3. garnet disc
4. cuttle disc

Answer: a. 1, 3, 4 and 2
b. 3, 1, 4 and 2
c. 1, 4, 3 and 2
d. 3, 1, 2 and 4

12. What is the first step in fabricating a temporary crown?

a. measuring the mesial distal space between the contact areas
b. selecting the appropriate crown size
c. obtaining an alginate impression
d. checking occlusion for prematurities

13. What is a possible solution if the preformed polycarbonate crown binds at the preparation finish line?

1. adjust the finish line
2. increase the marginal diameter with a carbide bur
3. adjust the interior of the crown with a round bur

Answer: a. all of the above
b. 1 and 2
c. 2 and 4
d. 2 only
e. 3 only

14. What direction should an explorer be used to check the marginal adaptation of a temporary crown?

a. around the circumference of the crown
b. from the gingival to the occlusal surface
c. from the occlusal to the gingival surface
d. all of the above

15. What type of resin material is bi-acryl?

a. methyl methacrylate
b. ethyl methacrylate
c. composite
d. epimine

16. Which type of resin material results in the greatest amount of shrinkage?

    a. vinyl ethyl methacrylate
    b. methyl methacrylate
    c. epimines
    d. composite

17. When fabricating a custom acrylic crown, what is the best indicator that the crown is ready to be placed on the tooth?

    1. high gloss
    2. heat production
    3. loss of highlights
    4. doughy consistency

    Answer: a. all of the above
    b. 1 and 4
    c. 2 and 3
    d. 3 and 4
    3. 1 and 2

18. Which of the following types of temporary crowns can be relined?

    1. polycarbonate
    2. custom acrylic
    3. aluminum
    4. cellulose

    Answer: a. all of the above
    b. 1, 2 and 4
    c. 2, 3 and 4
    d. 1 and 2 only

TRUE/FALSE (2 point each): CIRCLE T IF THE STATEMENT IS CORRECT; CIRCLE F IF THE STATEMENT IS INCORRECT.

T F 1. A good preformed crown will usually fit without adjustment.

T F 2. When contacts between the crown and adjacent teeth are being tested, the floss should meet some resistance.

T F 3. When adjusting the inciso-gingival length, the operator should try seating the crown in several different positions to find the best fit.

T F 4. For a crown to fit properly, its facial and lingual contours must be in the same planes as those of adjacent teeth.

T F 5. Eugenol cements tend to deteriorate resins when they are in contact for a period of time.

T F 6. When a tooth preparation has been cut, the finish line always has the greatest circumference.

T F 7. Composite resin can be used when relining any type of resin material.

T F 8. Alginate impressions are used in conjunction with the intraoral moulding technique.

T F 9. An advantage of a silicone putty impression is that it can be used as a final impression.

T F 10. A vacuum-formed plastic resin tray is recommended for construction of a single tooth crown.

T F 11. Asepsis is not a concern when working in the laboratory.

T F 12. A discrepancy of 0.5 mm between the crown and the finish line is acceptable.

T F 13. When removing cement after cementing a temporary crown, the floss should be removed in a vertical direction.

T F 14. A prepared tooth should be thoroughly dried prior to cementation.

TEMPORARY CROWNS
FINAL EXAMINATION

ANSWER SHEET

MULTIPLE CHOICE (2 points each)

1. d
2. c
3. d
4. c
5. c
6. b
7. b
8. b
9. b
10. d
11. a
12. d
13. d
14. b
15. c
16. b
17. d
18. a

TRUE/FALSE (1 point each)

1. F
2. T
3. F
4. T
5. T
6. T
7. F
8. F
9. T
10. F
11. F
12. T
13. F
14. F

EXPANDED FUNCTIONS EXAMINATION

EVALUATION FORM

Candidate:______________________________
Date:___________
Final Grade:____

Temporary Preformed Aluminum Crown/Tooth #_____

CRITERIA	EXAMINER	VALIDATOR
1. Crown contacts with the adjacent teeth		
Mesial		
Distal		
2. Facial and lingual surfaces are in the same plane as the adjacent teeth		
3. Crown margins meet preparation 0.5 mm of the finish line Buccal/Lingual		
4. Fits snugly against the finish line		
5. All centric marks are consistent on each tooth (same intensity as adjacent teeth)		
6. Crown surfaces are smoothed		

2 errors or less is a pass.

3 errors or more with validation constitutes a failure.

EXPANDED FUNCTIONS EXAMINATION

EVALUATION FORM

Candidate:______________________________
Date:______________
Final Grade:______

Temporary Polycarbonate Crown/tooth #_______
Temporary Custom Acrylic Crown/tooth#_______

CRITERIA	EXAMINER	VALIDATOR
1. Crown contacts adjacent tooth		
Mesial		
Distal		
2. Crown margins meet preparations with 0.5 mm of the finish line		
Buccal/Lingual		
Interproximal Mesial/Distal		
3. Marginal ridge height of crown is acceptable with adjacent teeth		
Distal		
Mesial		
4. Crowns contour resembles that of the original tooth		
Facial		
Lingual		
Incisal or Occlusal		
5. Crown is smoothed and polished		

3 errors or less is a pass.

4 errors or more with validation constitutes a failure.

Module 3-C

TEMPORARY CROWN RESTORATIONS

Student Module

TEMPORARY CROWN RESTORATIONS

Second Edition

Produced by

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Updated Version and Module 5

By

LUANN SPAIN, C.D.A.

Adopted by

Idaho State Board for Vocational Education
650 West State Street
Boise, Idaho

1991

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TEMPORARY CROWN RESTORATIONS

COURSE OUTLINE

Clock Hours

Lecture/Demonstration:	5 1/2 Hours
Laboratory:	12 Hours
Written Examination;	30 Minutes
Final Practical Examination:	Instructor will announce final practical examination time during this course.

Course Description

The primary goal of this course is to provide the dental assistant with background knowledge and laboratory instruction in the placement of temporary crown restorations. Instruction includes placement in three types of temporary crowns: preformed aluminum, preformed polycarbonate and custom acrylic. Upon successful completion of the course, the student will receive a certificate of completion/recognition to perform this function. Students taking this course are required to have successfully completed the Fundamentals of Dental Assisting course and have six months dental assisting experience prior to enrolling.

Required Text

Temporary Crown Restorations, second edition, Project ACORDE--U.S. Department of Health, Education and Welfare, 1979, Updated version 1991, LuAnn Spain, C.D.A.

Course Requirements

For successful completion of the course, each participant must complete the following requirements:

1. Attend all class and laboratory sessions.

2. Place 2 acceptable preformed aluminum crowns during laboratory session.

3. Place 2 acceptable preformed polycarbonate crowns during laboratory session.

4. Place 2 acceptable custom acrylic crowns during laboratory session.

After completing the practice for each temporary crown, it should be feasible for the student to complete a temporary crown in less time. The suggested time for practice of aluminum temporary crowns is: 55 minutes, first trial; 30 minutes, second trial.

The suggested time for practice for the polycarbonate temporary crown is: 1 hour, first trial; 40 minutes, second trial.

The suggested time for practice for the custom acrylic crown is: 2 hours, first trial; 1 hour, second trial.

A minimum score of 85% must be reached to be considered acceptable. This may require placing several temporary restorations to meet an acceptable level.

5. Achieve a minimum of 75% on the written examination.

6. Successfully complete the final practical examination to receive a certificate of completion/recognition to perform this function (preformed aluminum crown on Columbia Dentiform Tooth #19; polycarbonate crown on Columbia Dentiform Tooth #8; custom acrylic temporary crown on Columbia Dentiform Tooth #14). A minimum score of 85% must be reached to be considered acceptable.

7. Materials to be supplied by the student:

    a. anterior and posterior preformed temporary crowns;

    b. refer to armamentarium in each module;

    c. slow speed handpiece with straight sleeve;

    d. expendable supplies as designated by the instructor.

Evaluation/Grading

This course is designed on a Pass/Fail basis. In order for the student to pass the course, the requirements listed above must be successfully completed. As previously stated, the minimum percentage for acceptable temporary crowns is 85% and a minimum of 75% must be achieved on the written examination. A description for determining the percentage of scores is presented below.

A. Calculating Percentages for Temporary Crowns

Refer to the attached evaluation forms (they are the same as the forms found on pages 35, 60 and 77 of the corresponding

Temporary Crown Restorations Module). Each criteria is evaluated as follows:

2 = Acceptable
1 = Improvable
0 = Unacceptable

Points are assigned to each of the above as follows:

2 = 2 points
1 = 1 point
0 = 0 points

For the aluminum crowns (page 35) there are 7 criteria, each worth a maximum of 2 points--for a total of 14 points possible. For the polycarbonate (page 60) and custom acrylic crowns (page 77), the evaluation forms list 10 criteria, again worth a maximum of 2 points each for a total of 20 points possible. A percentage score can then be calculated by adding the total number of points earned and dividing by the total points possible (either 14 or 20).

To facilitate calculations, the following calculation scale is provided:

Preformed Aluminum Crowns

Points Achieved	Percentage
14	100
13	92.8
12	85.7 proficiency level
11	78.5
10	71.4
9	64.2

Preformed Polycarbonate Crowns/Custom Acrylic Crowns

Points Achieved	Percentage
20	100
19	95
18	90
17	85 proficiency level
16	80
15	75
14	70
13	65

B. Calculating Percentages for Written Examination

For each wrong answer on the written examination, subtract 4 points for each multiple choice and 2 point for each true/false from 100 to determine final score.

Objectives

Following completion of lecture and laboratory activities, the student will be able to:

1. Explain why temporary crown restorations are placed.
2. List and describe the types of temporary crowns, their advantages and disadvantages.
3. List and explain the types of finish line forms.
4. Describe types of resin materials and their advantages, disadvantages, and demonstrate proper mixing technique.
5. Describe the procedures of each type of temporary crown.
6. Fabricate a crown from each module according to the stated criteria.
7. Define and explain the importance of correct occlusion.
8. Demonstrate the ability to correctly evaluate each crown placement that meet and do not meet the criteria for restorations of these preparations.
9. List and describe additional techniques that are employed for fabrication of custom crowns.
10. Explain the advantages of the updated techniques for custom temporary crowns.
11. Define the purpose of temporary cement.
12. Explain aseptic techniques as it applies to these modules.

Procedure

1. Read Temporary Crown Restorations Modules.
2. Answer study questions on pages 18, 36, 61, 79, and 85 of modules.
3. Answer objectives listed above.
4. For supplementary reading, refer to the references listed at the end of the modules.

COURSE SCHEDULE

Clock Hours	Method of Instruction	Topic/Activity	Assigned Readings
2	Lecture/ Demonstration	Introduction to Course Background Information --Purpose of temporary coverage --Types of temporary crowns --Types of Resins	
		Aluminum Temporary Crowns Materials and Instruments --Selection of crown --Adjusting length	Temporary
Crown Restoration		--Reducing circumference --Checking occlusion --Checking contacts --Cementing Crown --Evaluating Crown	Module pgs. 20-29
	Videotape	View Project ACORDE Videotape "Aluminum Crowns on Dentiforms"	
2	Laboratory	Students practice placement of preformed aluminum crowns on dentiforms to complete course requirements* (2 acceptable aluminum crowns) *Refer to Page ___, Course Requirements	
1-1/2	Lecture/ Demonstration	Preformed Plastic (Polycarbonate) Temporary Crowns Materials and Instruments Procedure --Selection of crown --Adjusting length --Mixing and placing resin --Trimming crown margin --Polishing crown --Checking occlusion --Cementing crown --Evaluating crown	Temporary Crown Restoration Module pgs. 42-63

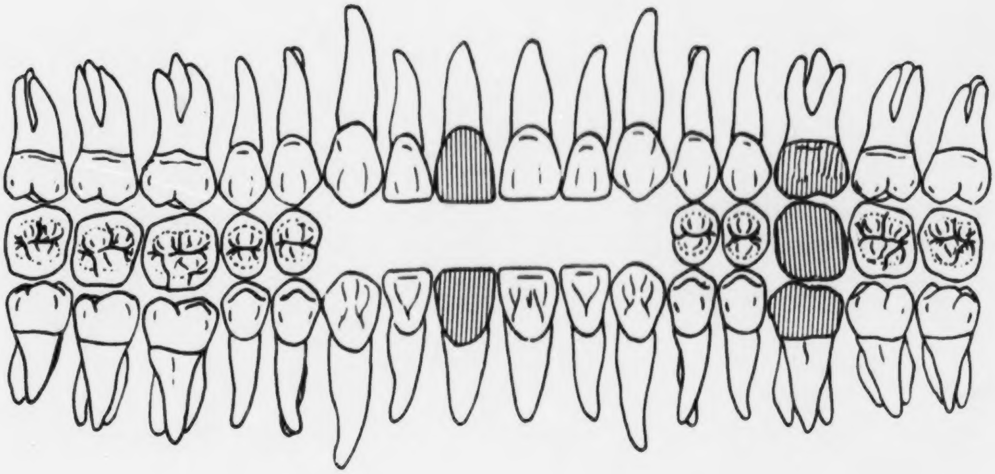
	Videotape	Project ACORDE videotape, "Preformed Plastic Crowns"	
3	Laboratory	Students practice placement of preformed plastic crowns on dentiforms to complete crown requirements.* (2 acceptable polycarbonate crowns) *Refer to Course Requirements Page vi.	
2	Lecture/ Demonstration	Custom Plastic Temporary Crowns Materials and Instruments Procedure (direct technique) --Obtaining alginate impression or other types of matrix --Obtain crown preparation --Mixing and placing resin --Fabricating the acrylic crown --Removing crown from impression --Checking occlusion --Checking contacts --Finishing crown --Cementing Crown --Evaluating Crown	Temporary Crown Restoration Module pgs. 66-79
	Videotape	View Gordon Christensen's videotape "Simple Temporary Fixed Prosthodontics"	
7	Laboratory	Students practice placement of custom acrylic crowns on dentiforms to complete course requirements.* (2 acceptable custom acrylic crowns) *Refer to Course Requirements, page vi.	

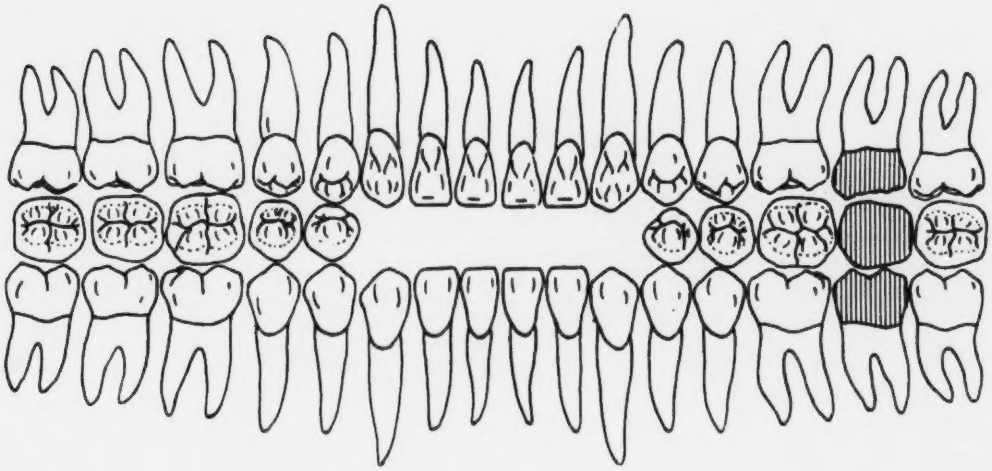
30 minutes	Written Examination	A comprehensive written examination consisting of multiple choice and true/false questions.

NOTE: Your instructor will provide further information about the final practical examination during your course.

module 1

introduction to the course





TEMPORARY CROWN RESTORATIONS

INTRODUCTION

The Project ACCORDE Temporary Crown Restorations consists of three modules, "Preformed Metal Crowns," "Preformed Plastic Crowns," and "Custom Resin Crowns." For additional reference, the supplemental module "Additional Techniques Employed for Fabrication of Custom Temporary Crowns" has been included in the Project Accorde module. It is essential that you read the background information, a description of procedures and criteria, and review the evaluation form.

The procedure description will provide step-by-step instructions for each procedure involved in the temporary crown restoration. Procedures outlined in the modules are designed specifically for the learning situation, with an emphasis on introducing new concepts and skills. It should be understood that procedures and techniques may vary with each dental office. Only a limited amount of experience can be gained in a lab situation, so it is suggested that students seek additional experience in the dental office.

Evaluation is a vital element of this course and it is the responsibility of both the student and the instructor. Your ability to evaluate your own work, according to the criteria, will help you gain an even better understanding of the proper techniques and procedures. In a dental situation, the quality of your temporary crowns will depend largely on your ability to self-assess your work. The instructor's evaluation will guide you in the application of the accepted criteria and in the development of your skills.

Tests are an important part of the evaluation process. They check your knowledge of the technical background information and your ability to apply both knowledge and skill to similar but different temporary crown restorations. Your instruction will test you on the different temporary crowns, after competence has been gained in all areas.

BACKGROUND INFORMATION

When the pathology of a tooth is such that a cavity preparation and amalgam or a tooth-colored restoration are considered inadequate to restore the tooth to its original form and function--that is, if the tooth is badly decayed, brittle as a result of endodontic treatment, losing function, or unaesthetic--one satisfactory restorative method is the application of a crown. Crowns are also used to cover undamaged teeth when bridge abutments are required.

From the standpoint of the patient's oral health, the care and placement of temporary crowns is essential for the following reasons:

1. **TO PREVENT SENSITIVITY IN THE PREPARED TOOTH.**

   During crown preparation, portions of the teeth's enamel and dentin are removed. Dentin contains microscopic tubules that originate in the pulp and terminate at the dento-enamel junction. As the dentin is prepared, the tubules are severed and left open, leaving the highly sensitive pulp of the tooth exposed. It is important not to desiccate the preparation because of the sensitivity that occurs with the tubules severed. Because the tubules are open, it is necessary to consider the chemical composition of the material that is placed adjacent to the dentin. If potentially irritating substances must be used, dentin can be protected by coating the surface of the preparation with a substance that seals the tubules.

2. **TO PROTECT THE DENTIN FROM ORAL FLUIDS.**

   Oral fluids may cause sensitivity.

3. **TO MAINTAIN OCCLUSION.**

   To prevent supra-eruption of the prepared tooth or the opposing tooth, and to prevent movement of the prepared tooth or the adjacent teeth.

   The contact of the mandibular teeth against the opposing maxillary teeth during functional and non-functional movement of the mandible is called occlusion. Occlusion will be discussed in more detail later in this module.

4. **TO PREVENT FRACTURING OF THE FINISH LINE OR BREAKDOWN OF THE PREPARED TOOTH**.

Emphasis is given to the finish line of the preparation, commonly stated as the place where the bur stops. The finish line is a continuous edge that borders the entire preparation. It is essential that you have a mental image of the location and contour of a preparation's finish line in order to contour a temporary restoration for that tooth. (Shown later are the various forms of finish lines.)

5. **TO PREVENT CHANGES IN GINGIVAL TISSUE, CAUSED BY INFRINGEMENT OF THE CROWN MARGIN ON THE FREE GINGIVA OR BY FOOD IMPACTION**.

Since most clinical crown preparations present subgingival finish lines, crown margin contour is critical to the health of the gingiva. Should the crown intrude on the gingiva, irritation will result, causing the patient discomfort. Recession, inflammation, ulceration, and infection of the gingiva are possibilities.

Food impaction is likely to occur if the walls of a crown are not properly contoured to reproduce normal anatomy or its contacts with adjacent teeth are not adequately established. Firm contacts normally exist between teeth (in the middle third for posterior teeth and in the incisal third for anterior teeth), which force food to be broken down into two parts and distributed down the facial and lingual surfaces of the teeth. If there is no contact, biting pressure forces food between the teeth and gingiva. The food can cause irritation, which may lead to inflammation and infection.

6. **TO PROVIDE FOR LOST FUNCTION**.

A temporary crown may be placed to protect a chipped tooth and to restore ideal occlusion and surface anatomy.

7. **TO MAINTAIN FOR LOST FUNCTION**.

This is especially important in the anterior permanent teeth.

8. **TO ALLOW THE PATIENT TO BEGIN ADJUSTING TO A PERMANENT CROWN**.

9. **TO RESTORE OR IMPROVE THE CONTOUR OF THE ORIGINAL TOOTH**.

An example would be a chipped incisal edge.

TYPES OF TEMPORARY CROWNS

Several types of temporary crowns and crown material are available. Those that are commercially available are: preformed anatomical metal crowns, non-anatomical metal crowns, preformed polycarbonate crowns. Cellulose crown forms, as well as synthetic resin the operator can use to fabricate custom resin crowns.

Anatomical Metal Crowns

The term "anatomical" refers to crown forms whose exteriors approximate natural teeth in facial, lingual, mesial and distal contours, as well as in the contours of the occlusal surfaces (cusps, ridges, pits, and grooves).

1. The Stainless Steel Crown is the most durable of the preformed anatomical crowns, which is used most often in restoring primary teeth. Such a crown can provide temporary coverage for months or years. The short comings of the stainless steel crown include its poor aesthetic quality for placing on an anterior tooth and the difficulty of adapting its rigid metal margin to the tooth preparation.

2. An Anodized Aluminum Crown is used most commonly on premolars and molars because of their resistance to wear, strength and unaesthetic appearance. The chief advantage of this crown is its malleability, which allows for good occlusal adjustment. Tin, silver alloy crowns are the softest and most ductile crowns commercially available for temporary coverage of posterior permanent teeth. The softness of the alloy eases marginal and occlusal adaptation, as the material will stretch up to 50%. It can also be contoured and burnished without wrinkling. Softness, however, is the chief disadvantage of this crown. It can easily wear through during normal mastication; hence, is recommended for a short time, unless it can again be re-lined with acrylic resin for added strength.

Non-anatomical Preformed Metal Crown

These crowns are sometimes referred to as "tin cans," or aluminum shell crowns. They are made chiefly of aluminum alloy and are simple cylindrical shells for protecting posterior teeth. All contours and occlusion must be developed by the operator. The only advantage of the non-anatomical metal crown is its low cost. It has been largely replaced in recent years by the more efficient anatomical metal crown.

Preformed Plastic Crowns

These crowns are used as temporary coverage for anterior teeth. The advantage of these crowns from the patient's point of view is that they are tooth-colored making them aesthetically pleasing replacements. From the operator's view, they can be made to fit the preparation easily, as it can be shortened by cutting, or lengthened by adding resin.

1. Polycarbonate Preformed Crowns. These crowns are hollow, tooth-shaped with walls about 0.3 mm thick. Polycarbonate crowns are usually available in two tooth-colored shades. The operator selects the lighter or darker shade, which ever is closer to the color of the tooth being restored. The polycarbonate preformed crowns are more commonly used in practice than cellulose crowns.

2. Cellulose Crown Forms. This type of crown is a clear, hollow crown form. The advantage to this particular crown is that the operator is able to be more selective on the shade of the tooth. The disadvantage with the cellulose crown form is that when the form is removed from the acrylic resin, the adjacent teeth may be slightly out of contact. However, the operator is able to choose a larger variety of shapes and colors with this type of crown.

Custom Resin Crowns

The custom resin crown is tooth colored and is completely fabricated by the operator. The fit and external contours of the crown are superior to those of any other temporary crown, since it is made in an impression of the patient's mouth. The disadvantage to this crown is that some operators feel it takes longer to produce. But in time the operator may benefit with this type of crown.

The choice of an appropriate temporary crown depends on which tooth is to be restored, the patient's concern for aesthetics, and the length of time a temporary restoration must serve. With this information, you can make the judgement.

Finish Lines

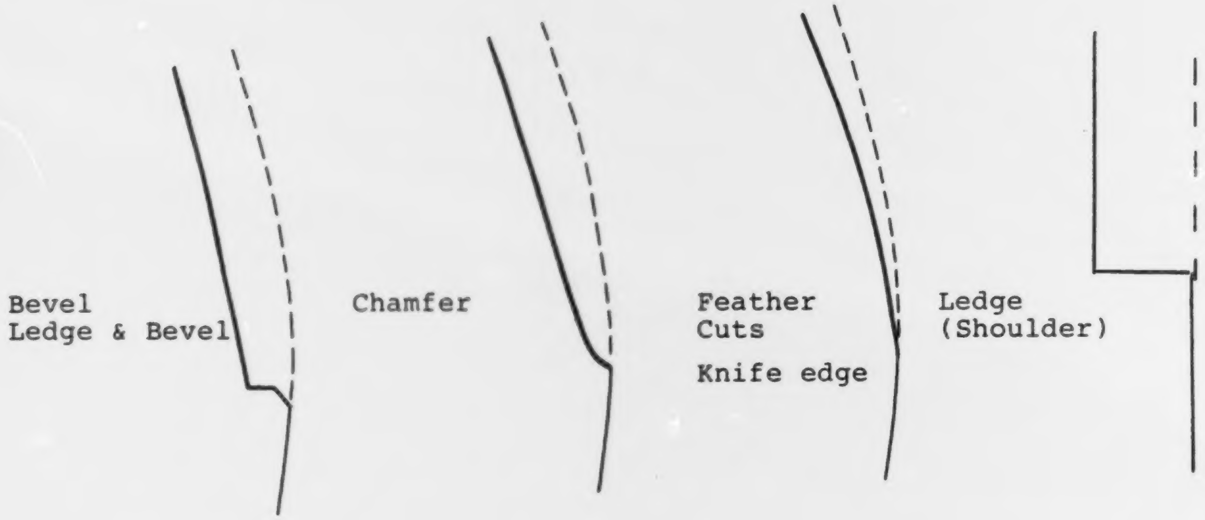
The finish line is a continuous edge that borders the entire preparation commonly the location where the bur stops. It is essential that you have a mental image of the location and contour of a preparation's finish line in order to contour a temporary restoration for that tooth.

Four common forms of finish lines are:

1. Bevel or slant
2. Camfer or slope
3. Feather or knife edge (a shallower slope), and
4. Shoulder or ledge.

These four commonly used finish lines (in Figure 1) may be used by themselves or in combinations. Variations may be developed by individual clinicians based on personal preference. Ask your instructor if you have any doubts about recognizing them.

FIGURE 1
COMMONLY USED FINISH LINES


Bevel
Ledge & Bevel
Chamfer
Feather
Cuts
Knife edge
Ledge
(Shoulder)

Bevel, chamfer, feather cuts and shoulder (left to right) are used at preparation finish lines.

When a preparation is cut, the circumference of the tooth either increases or remains the same, with the finish line always at the greatest circumference. This shape permits easy placement and removal of a restoration. A chamfer, bevel or shoulder provide somewhat of a shelf which the restoration can "hug," thus achieving a snug fit of the crown's margin (the gingival edge). The temporary restoration, when well adapted, protects the finish line from chipping and prevents marginal leakage of mouth fluids and bacteria, which could cause sensitivity and decay of the exposed dentin.

Should a preparation narrow towards the finish line, that area would be an undercut. Such narrowing is an error in preparation that makes placement of the crown impossible and prevents marginal seal and/or full seating. Since a crown is fabricated to fit the largest circumference of a preparation, any area gingival to that largest dimension will not be sealed. Convexities (positive contours) present similar problems and also tend to prevent marginal seal.

Resin Materials

Resin material is used to line the preformed polycarbonate crown, cellulose crown form, or as a liner for aluminum temporary crowns. It is also fabricated to form a custom temporary crown. The commonly used resin is a combination of a polymer (powder) and a monomer (a liquid); however, it is important that all of the powder used be incorporated into the liquid. There is no exact proportion of monomer to polymer. The more powder there is, the stronger the mix is, but if the mix is too dry (if it has too much powder), it does not flow and, therefore, does not conform to the contours of the preparation. If there is too much liquid, the mix runs out of the crown when it is placed. While the acrylic resin has some very desirable qualities, it also has some characteristics that require special attention. Because monomer in its pure form is toxic to the tooth, it is extremely important that it be thoroughly incorporated into the mix. When mixed, the polymer and the monomer polymerize (react chemically) and produce heat, in an exothermic reaction. If large amounts of dentin have been removed from a tooth during preparation, the tooth is likely to be sensitive to the heat. The gingiva are also heat-sensitive, so the air spray should be used to cool the area while the resin is hardening.

Five major categories for temporary resin materials are:

1. Methyl Methacrylates
2. Ethyl Methacrylates
3. Vinyl Ethyl Methacrylates
4. Epimines
5. Composites

Methyl Methacrylate

Methyl methacrylate is formed by the mixture of a monomer (liquid) and a polymer (powder) which polymerizes (chemically bonds) and hardens into a durable plastic. Various mixing techniques will be explained later.

Methyl methacrylates have an advantage for their excellent color, stability and wear resistance. If it is important to maintain the vertical dimension or if strength is very important, it is recommended that the temporary crown be fabricated with methyl methacrylate. Unfortunately, this material tends to generate more heat during the polymerization which increases the possibility of pulp irritation when it is in contact with the cavity preparation during fabrication. It will be important to remove the temporary crown during the polymerization period or to apply air from the air/water syringe during this process. The other disadvantage is the extensive setting shrinkage because of the heat that is generated.

Light-Cure Resin

A new type of methyl methacrylate resin that is not shown on the table is a light-cure resin. This resin material is not self-curing, meaning it does not cure until it is exposed to a visible light. (The visible light is the type of light that is used with composite resin material.) The light-cured resin comes in a monomer and polymer form but because the resin does not cure without light, it allows the operator time for preparation and correction before curing. In cases of temporary inlay and onlay with undercuts, removal of undercuts, etc., can be easily performed after extracting the rubber-like resin from the mouth. This particular resin is of very low shrinkage and excellent color stability. The other advantage with the light-cured resin is that it will adapt with the conventional chemical self-cure resin that is of the same methyl methacrylate base. A common brand name for a light-cure material is Unifast LC.

> **NOTE:** There are light-cure resins that do not come in a monomer or polymer form but in a putty-like consistency. They have an excellent ease of use. A common brand name for this type of light-cure resin is Triad.

Ethyl or Vinyl Ethyl Methacrylates

Ethyl or vinyl ethyl methacrylates have similar clinical properties, except with the color stability; ethyl methacrylates have been found to be less stable. Their decreased color stability may or may not be a disadvantage depending on the length of time the temporary will be in service and its location.

Ethyl and vinyl ethyl methacrylates do generate less heat than the methyl methacrylates, resulting in a decrease in setting shrinkage. They have an advantage over methyl methacrylates because they are easier to use and there is less potential damage to the tissue. Factors that may cause tissue irritation include the intimate contact of free monomer, the heat generated by the setting reaction, and an allergic reaction. Therefore, care should be taken to lightly coat tissues with petroleum jelly to prevent these irritations while the resins are undergoing chemical and thermal reactions.

Epimines

Epimines is a combination of base and catalyst which forms a paste. The epimines generate little heat during polymerization which creates the least amount of shrinkage of any of the resin materials. The disadvantage of this resin is its poor color stability and wear resistance. Epimine resins do not react with zinc oxide eugenol (ZOE) cement. Therefore, the operator can remove the old ZOE cement from the internal aspect of the temporary crown and re-cement it without experiencing the usual soft, rubbery condition noted when using the methyl or ethyl methacrylates.

Composites

Another type of material that is not listed on the table is bis-acryl composite. A common brand is Protemp. This material comes in two-tube form: one of catalyst and one of base. They have high strength, very low heat and shrinkage. The disadvantage with bis-acryl composite is that it does not have a putty stage and is fairly expensive. Because bis-acryl is a composite resin it will adhere to other composite restorations. For example, composite restorative material can be used to cover voids when the crown does not meet the finish line.

FIGURE 2
CLINICAL PROPERTIES OF MAJOR PROVISIONAL RESIN PROPERTIES

Table 16–1. Clinical Properties of Major Provisional Resin Materials

	Methyl Methacrylates	Ethyl Methacrylates	Vinyl Ethyl Methacrylates	Epimines
Examples	Jet (Lang) Temporary bridge resin (caulk)	Splintline (Lang)	Trim II (Bosworth) Snap (Parkell)	Scutan (Premier)
Cost (per kit) (Nov. 1983)	$14.00–$18.00	$22.00–$23.00	$21.00–$23.00	$30.00
Heat generation	greatest	moderate	moderate	least
Shrinkage	greatest	moderate	moderate	least
Color stability*	best	third best	second best	worst
Putty stage†	yes	yes	yes	no
Rubbery stage†	no	yes	yes	no
Wear resistance	best	intermediate	intermediate	worst
Setting time	4–11 min.‡	2–7 min.‡	2–7 min.‡	2–3 min.§

*Crispin, B. J., and Caputo, A. A.: Color stability of temporary restorative materials. J. Prosthet. Dent. *42*:27 1979.

†Christensen, G. J.: SNAP by Parkell Section I. The Associates Report on Products. Clin. Res. Assoc. (Newsletter), *1*:12, 1977.

‡Christensen, G. J.: SNAP by Parkell Section I. The Associates Report on Products. Clin. Res. Assoc. (Newsletter), *3*:11, 1979.

§Premier Dental Products Co., Philadelphia, PA—manufacturer's directions.

OCCLUSION

The contact of the mandibular teeth against the opposing maxillary teeth during functional and non-functional movement of the mandible is called occlusion. The static position of the bite is called centric occlusion.

In the normal adult dentition, the supporting cusps maintain centric stop contacts with opposing fossae and/or ridges and thus maintain the occlusal vertical dimension of the face. In order to maintain a stable centric occlusion, the forces applied to these centric stops should be directed down the long axes of the teeth.

The lingual cusps of the maxillary molars and premolars are supporting cusps that create centric stop contact with the opposing mandibular fossae and/or ridges. The facial buccal cusps of the mandibular molars and premolars are also supporting cusps that contact opposing maxillary fossae and/or ridges.

The maxillary facial buccal cusps have no centric contact. They are positioned with facial horizontal overlap relative to the mandibular facial buccal cusps, and they serve to keep the patient's cheek off the occlusal table.

The mandibular lingual cusps also have no centric contact. They are positioned with lingual horizontal overlap relative to the maxillary lingual cusps, and they serve to keep the patient's tongue off the occlusal table.

From a facial view of the dentiform's occlusion, you will notice the posterior teeth have a tooth-to-two-teeth centric contact (Figure 3). That is, each posterior mandibular tooth contacts two opposing maxillary teeth, and each posterior maxillary tooth contacts two opposing mandibular teeth. Though there are other theories of occlusion and you will find unlimited variations on patients, this occlusal pattern is described in this course because manikins or dentoforms are typically manufactured with this scheme.

It is expected that the student will have some background in occlusion before beginning the course; therefore, only a functional explanation of occlusal checks is given.

In the clinical situation, occlusal patterns should be recorded on the patient's diagnostic casts. If the casts are articulated (hinged together to reproduce mandibular movements), articulating paper (blue carbon) can be used directly on the casts to produce markings that indicate maxillary-mandibular contacts. Near-ideal occlusion is assumed on the dentiforms, so a marking should appear on each tooth except the incisors, which are typically out of occlusion (Figure 4). Ideal occlusion would produce the markings that appear in Figure 5. The identical pattern should appear after crown placement. Clinically, excursive and protrusive occlusion would also be checked, but this is not practical with dentiforms and is therefore not required here.

A marking on every tooth except the crown restoration indicates that the restoration is in infra-occlusion, or below the occlusal plane of the adjacent teeth. This could initiate supra-eruption (extrusion beyond the occlusal plane of the adjacent teeth) by the opposing teeth, an irreversible process. The appearance of a marking on the crown alone indicates the crown is in supraocclusion (beyond the occlusal plane of the adjacent teeth) which may cause opposing teeth to intrude into their sockets, thereby weakening and sensitizing them. Another destructive process that can be instigated by improper occlusion is the movement (drift) of teeth that can result when occlusal forces are not directed along the long axis of the teeth. From the operator's point of view, it is important for temporary crown restorations to maintain a stable occlusal relationship because a prepared tooth without occlusal contact may erupt or shift position within a few days. If this occurs, the permanent crown will be in supraocclusion (too high) or impossible to seat, necessitating the fabrication of another permanent crown. Because of these possibilities, great attention is given to checking and restoring proper occlusion during temporary crown placement.

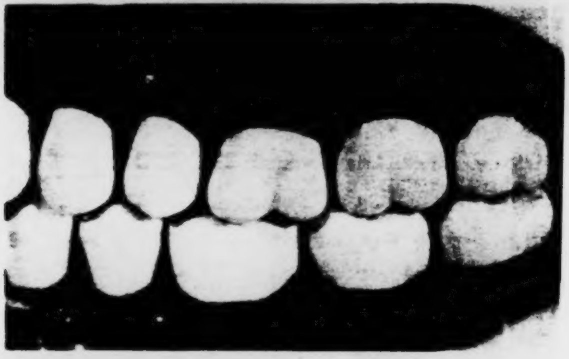
Blue marks on the slopes of cusps or on marginal ridges indicate destructive forces and are unacceptable. If they occur, continue articulating until you achieve an acceptable occlusion. Since teeth in dentiforms are difficult to maneuver and to maintain in ideal occlusal relationships, it will only be necessary to have one of the four centric marks at the same intensity as produced on the unprepared tooth, in order to fulfill the occlusal requirement when the crown has been placed. (Acceptable occlusion in a dentiform is shown in Figure 4.)

Temporary Cement

Temporary cement is used to hold the restoration in place. It fills the space between the crown and the preparation, thus supporting the occlusal contours, filling and sealing the margin/finish line area.

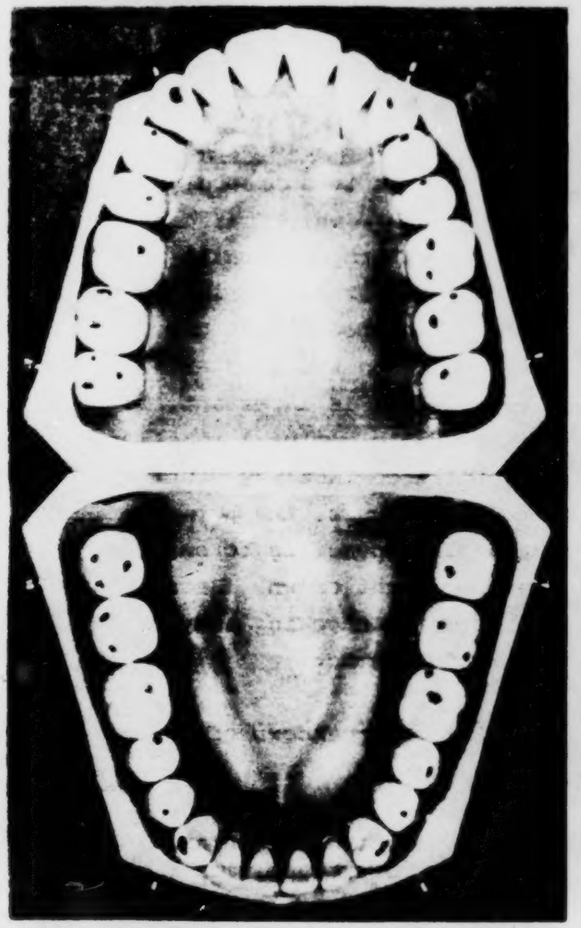
Zinc oxide and eugenol (Z.O.E.) are commonly combined as a temporary cement. The eugenol is an anodyne (a substance with a sedative effect), which reduces pain perception. Z.O.E. is also desirable because it is easy to remove from the tooth after the temporary crown has served its purpose, thereby limiting trauma to

FIGURE 3
TOOTH-TO-TWO TEETH CENTRIC CONTACT



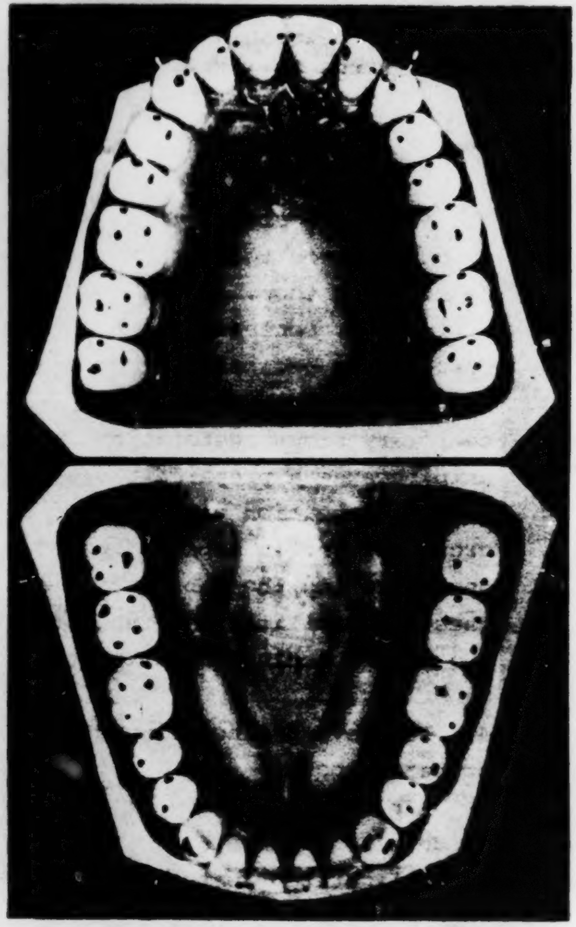
Tooth-to-two-teeth centric contact of posterior teeth.

FIGURE 4 PATTERN OF OCCLUSAL MARKINGS



Model teelth showing a pattern of occlusal markings acceptable in dentiforms.

FIGURE 5 IDEAL PATTERNS OF OCCLUSAL MARKINGS



Model teeth showing the ideal patterns of occlusal markings

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the dentin. In combination with saliva, Z.O.E. tends to break down acrylic resin and therefore is questionable for use with acrylic crowns. But non-eugenol cements, of which there is a large selection, would be equally appropriate for temporary restorations. Keep in mind that temporary cement is soluble in water and saliva and will break it down in time.

During cementation it is imperative to remove all debris, to rinse and dry (not to desiccate) the preparation, and to isolate the area with cotton rolls to prevent contamination by saliva. Depending on the consistency of the cement mix, cement creates pressure as it dries, occasionally forcing the crown in an occlusal direction. This can be detected by a post-cementation occlusal check. Minor occlusal prematurities (high contacts) can generally be adjusted with the crown in the patient's mouth. Gross malocclusion (deviation from acceptable contact) will also tend to lift the crown from the preparation finish line; adjustment necessitates removal and re-cementation of the crown. Holding the teeth firmly together in centric occlusion during cementation should prevent most of these problems.

Placing Temporary Crowns

Although the placement of each type of temporary crown is different, there are some conditions that must be met in order for a temporary restoration to be satisfactory: the margin of the crown must fit snugly against the finish line of the preparation and must be sealed so that no oral fluids seep into the prepared area; the contacts with adjacent teeth and the occlusal pattern that exists before the tooth is prepared must be replicated not only when the finished crown is placed, but while the temporary crown is in service.

Many criteria for accomplishing the tasks that are described are stated in terms of a range of acceptable adjustment. A small degree of error in some areas will not distort the fit of the restoration or disturb the patient. The allowable errors for any temporary crown are:

1. The crown margin may be up to 0.5 mm short of (occlusal to) the preparation finish line. Marginal error away from the gingiva will not cause gingival irritation, whereas 0.5 mm toward the gingiva would be unacceptable. Up to 0.5 mm distance between the crown margin and the preparation finish line can be filled with cement without distorting fit or seal. This area is also protected by the gingiva since the finish line is normally apical to the gingival crest.

2. Assuming ideal gingiva, the facial and lingual surfaces of a crown may be slightly over-contoured without disturbing healthy tissue. Gross convexities, however, would create areas where food and bacteria could lodge.

3. Under-contouring in the gingival third on the interproximal surfaces is preferable to over-contouring, as it will not produce gingival pressure and irritation.

In an instructional setting, the student strives to produce a temporary crown that is "perfect;" however, in a clinical situation, temporary crowns frequently do not fit "perfectly" because the time to achieve perfection is too great, the crown is only temporary and the patient's oral health is not jeopardized.

ASEPTIC TECHNIQUE

Prevention of disease transmission by careful attention to aseptic technique before, during and after temporary restoration is required, as it is for all intra-oral procedures. Infection control guidelines for dental offices which have been published by the Center for Disease Control should be followed. Personal protection and barrier protection measures should be followed (e.g., gloves, mask, protective eye wear and lab coat). Cross-contamination should be avoided. Do not touch instruments, areas which have not been sterilized or disinfected. Practice proper hand washing techniques, properly clean, sanitize, disinfect or sterilize all instruments and equipment.

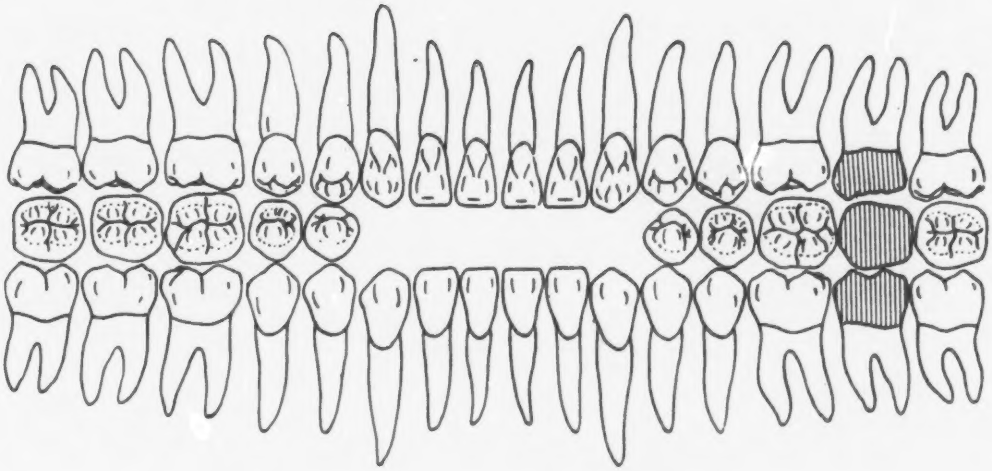
The patient treatment area should be clean, orderly and as sanitary as possible before, during and after use. The laboratory area used for clinical practice should also be kept as clean and orderly as possible. You are encouraged to be conservative with your dental materials, to keep mixtures of alginate, acrylic resins, and cements in small areas on the mixing pad and in the mixing bowl, to produce the best mix; and to perform all cutting, trimming, contouring, and finishing outside the mouth, clear of the dentiform, as you would with a patient. An efficient technique will result from having developed habits such as these.

STUDY QUESTIONS

1. Why are temporary crowns placed?
2. What care should be taken in placing temporary crowns?
3. What are the types of temporary crowns?
4. What is the purpose of a finish line?
5. List the major types of resin materials. What are their advantages and disadvantages?
6. Why is it vital that the liquid of the acrylic resin be thoroughly mixed with the powder?
7. What caution needs to be taken with monomer (liquid) and why?
8. What is occlusion and centric occlusion?
9. Why is it important to practice proper asepsis technique?
10. Why is it important that temporary crowns maintain a stable occlusion? What causes unstable occlusion?
11. During cementation, why is it imperative not to desiccate the preparation?

module 2

placing a preformed aluminum temporary crown



MODULE 2

PLACING A PREFORMED ALUMINUM TEMPORARY CROWN

Module 2 details the procedure for placing a temporary aluminum anatomical crown on the mandibular left second molar (#18). This crown is designed as a temporary covering for posterior teeth that have been prepared for full crowns. The chief advantage of the temporary aluminum crown is its malleability, which allows for good occlusal adjustment. Such aluminum crowns are used only on molars and premolars, where aesthetics is not a primary consideration.

Temporary aluminum crowns are thin-walled (slightly less than 0.5 mm) tooth-shaped shells, commercially produced to conform to ideal tooth anatomy. They are available in a range of sizes sufficient to cover most preparations. Although there is no sizing convention among manufacturers, preformed metal temporary crowns typically are produced for both molars and premolars and differ in size and occlusal anatomy. The aluminum crown is short and easily shaped so the idealized occlusal anatomy can be partially shaped into occlusion by the opposing teeth. Because these crowns are so soft, they must be handled gently.

Overview of Procedure

The first step in preparing a tooth for a temporary crown is to check occlusion, determining where the normal centric marks appear on the teeth. The dentiform should exhibit occlusal markings on every tooth except the incisors. The identical pattern of markings, with the same intensity as noted before preparation, should be replicated after placement of the temporary crowns.

After the tooth has been prepared, an impression is made and a cast is made and sent to the laboratory, where the crown is fabricated.

The mesio-distal space of the tooth to be restored is the primary dimension to be considered in selecting the crown. Because natural teeth vary in size and shape, it is unlikely that any preformed crown will ever fit a tooth without adjustment. When the best-fitting crown has been selected, it is then cut to the appropriate length, the edges crimped (bent upwardly) with hand instruments until proper fit is achieved. The rough edges of the crown are smoothed, and when proper occlusion is re-established, the crown is cemented over the preparation.

This temporary restoration procedure requires that you first study the contour of the unprepared tooth, certain features of which must be duplicated on the aluminum shell. Next, you should have an understanding of the slope of the chamfered enamel to the finish line of the prepared tooth, to help visualize the trimming and contouring required for the crown to fit snugly. To protect the prepared tooth, the ideal preparation is shaped to ensure good marginal seal when the crown margin is trimmed and crimped to hug the finish line of the preparation. Finally, attention to the occlusal plane and centric contacts will help replicate pre-preparation occlusion, which is to preserve tooth alignment and to ensure patient comfort.

Figure 6 shows the mesial view of the proximal surface of tooth #18. Figure 6a illustrates the unprepared tooth; the solid line in Figure 6b shows the prepared tooth and the broken line indicated the crown.

Figure 7 shows the facial view of tooth #18 unprepared (a) and prepared with crown (b).

Figure 8 shows the lingual view of the unprepared tooth and the crown.

Figure 9 illustrates the occlusal view of the unprepared tooth; the broken line indicates the finish line.

FIGURE 6 MESIAL VIEW OF TOOTH #18

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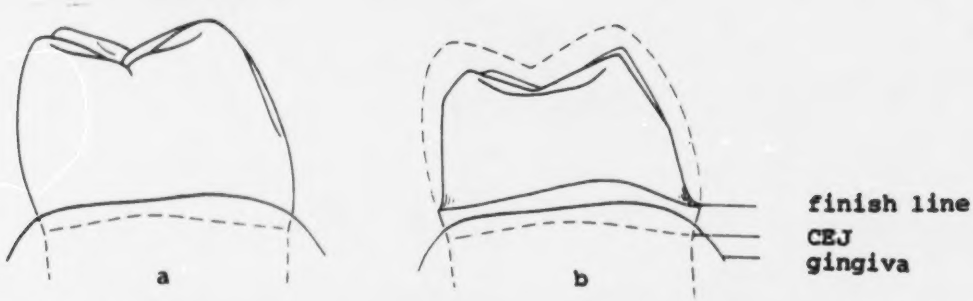
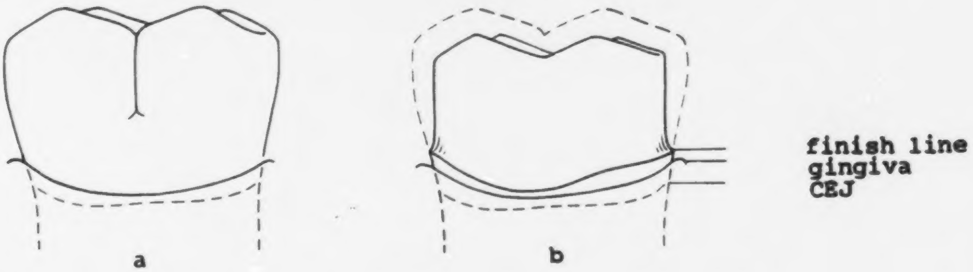
FIGURE 7 FACIAL VIEW OF TOOTH #18


finish line
CEJ
gingiva
a
b

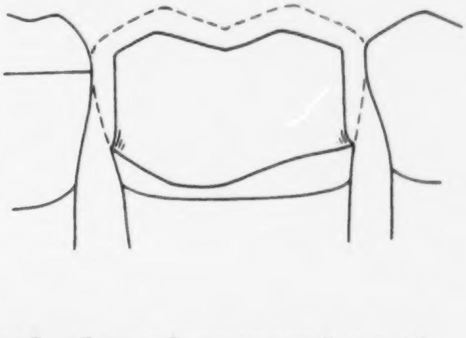
Mesial view of proximal surface of unprepared tooth #18 (a); prepared tooth with broken line indicating crown (b).

FIGURE 8 LINGUAL VIEW OF TOOTH #18

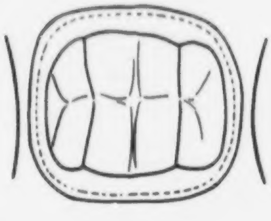

finish line
gingiva
CEJ
a
b

Facial view of unprepared tooth #18 (a); prepared tooth and crown (b).

FIGURE 9 OCCLUSAL VIEW OF TOOTH #18



Lingual view of prepared tooth with crown.



Occlusal view of prepared tooth #18.

ARMAMENTARIUM

1. articulating paper
2. prepared tooth #18
3. millimeter rule
4. assortment of preformed anatomical aluminum alloy crowns for tooth #18
5. dental mirror
6. curved crown and bridge scissors
7. explorer
8. contouring pliers
9. dental floss
10. T-ball, flat-tail burnisher or belling pliers
11. sandpaper disc (fine, medium garnet)
12. mandrels
13. pumice--impregnated rubber wheel
14. cotton rolls
15. lubricant (petroleum jelly or coca butter)
16. mixed pad

PROCEDURES

Preliminary Procedures

1. **CHECK TO BE SURE YOU HAVE ALL THE SUPPLIES LISTED IN THE ARMAMENTARIUM.**

2. **CHECK THE OCCLUSION** of the unprepared tooth on dentiform. Place blue articulating paper between the left maxillary and mandibular arches, and gently tap the teeth together in centric occlusion. There must be at least one occlusal mark on each tooth in both arches. This occlusal pattern must be replicated with the temporary crown.

3. **PLACE THE PREPARED TOOTH (#18) IN THE DENTIFORM.** Retain the unprepared tooth with its occlusal markings for future reference.

4. **VISUALLY AND TACTUALLY LOCATE THE FINISH LINE** of the preparation with the explorer and the mirror.

Crown Placement Procedures

1. **MEASURE MESIO-DISTAL SPACE AT THE CONTACT AREA AND SELECT THE CROWN.**

   Retract the cheek with the dental mirror, and use a millimeter ruler to measure the width of the mesio-distal space from the contact area of the left third molar #17, to the contact area of #19 molar in the middle third of the tooth. Select a crown whose width is equal to or greater than the measurement. It is better to select a crown that is slightly larger than the space, rather than too small, because the crown can be trimmed and shaped to fit. A crown that fits the mesio-distal space, is long enough occluso-gingivally and can be modified to fit snugly at the finish line.

   Criterion

   a. Procedure completed.

2. **TRY THE CROWN, AND CHECK ITS FIT.**

Orient the crown, and, using finger pressure, gently push it over the preparation until it is seated. The crown can be adjusted to approximate the contours of the unprepared tooth

and to re-establish occlusal and proximal contacts if the following relationships are observed:

a. The crown fits the mesio-distal space.

b. The facial and lingual contours of the crown should be in the same plane as those of the adjacent teeth. Use direct and indirect (mirror) vision to sight along the quadrant mesio-distally to make sure that the crown is not rotated or tilted on the preparation.

c. The crown should encompass the finish line of the preparation. If the crown is so long that it cannot be seated but it nevertheless meets the mesio-distal and facio-lingual size and contour criteria, it can probably be shortened to fit. If the crown margin is short of the finish line, it is too short, and another crown must be selected. Try crown forms until one meets the criteria.

d. The occlusal surface of the crown should be at or slightly above the occlusal plane of the adjacent teeth. Hold the mirror at the facial to view the occlusal plane of the teeth, and use the marginal ridges as an additional guide to proper seating, by comparing their level to those of the adjacent molars.

Criteria

a. The crown fits the mesio-distal space.

b. The facial and lingual contours of the crown are in the same planes as those of the adjacent teeth.

c. The crown margin meets or extends gingival to the preparation finish line.

d. The occlusal surface and the marginal ridges of the crown are in a plane with, or within 0.5 mm occlusal to the occlusal surface and the marginal ridges of the adjacent molars.

This is the first criteria stage of crown placement. It requires you to determine size and contour criteria visually. Be aware of minute shifts in the position of the crown and how they affect alignment with the adjacent teeth.

3. **SCRIBE A TRIM LINE ON THE CROWN THAT FOLLOWS THE FINISH LINE CONTOUR.**

The crown length usually needs adjustment. If the occlusal surface of the crown is above the occlusal plane of the adjacent teeth and the crown margin extends gingivally beyond the preparation finish line, the crown margin can be trimmed slightly to lower the occlusal surface. Study the contour of the preparation finish line with the dental mirror. With the crown fully seated on the preparation, estimate the amount of aluminum that will be necessary to remove to enable the crown margin to meet the finish line of the preparation exactly. The level and contour of the preparation finish line will be your guides for trimming the crown margin.

There are two methods of determining the trim line. Both are indirect and require you to visualize a reference point while scribing the trim line on the facial and lingual surfaces of the crown with an explorer. In one method hold the crown on the preparation, covering the preparation finish line. While visualizing the level of the preparation finish line, scribe a corresponding trim line along the marginal portion of the crown with an explorer. You may want to use the dental mirror to stabilize the crown while scribing. By the other method, hold the crown just above the preparation finish line so that its contour can be copied on the facial and lingual surfaces of the crown as you visualize the amount of trimming that is necessary (Figure 10). The contours of the finish line must be duplicated to obtain the proper occluso-gingival height. Since this may require several attempts, it is advisable to trim only a small amount at a time thereby avoiding over-trimming.

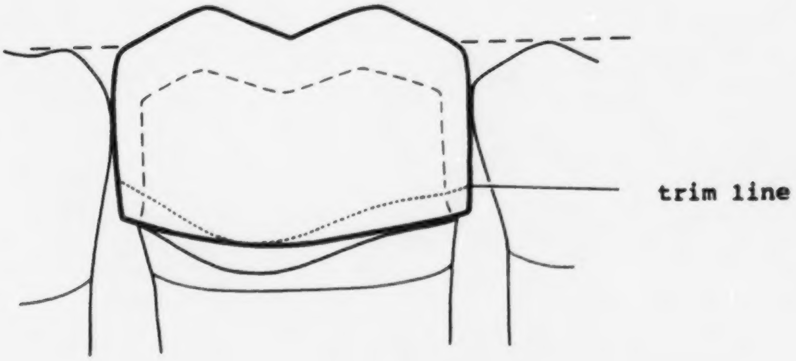
Criterion

a. Trim line scribed along the marginal area of the crown.

4. **ADJUST THE LENGTH OF THE CROWN.**

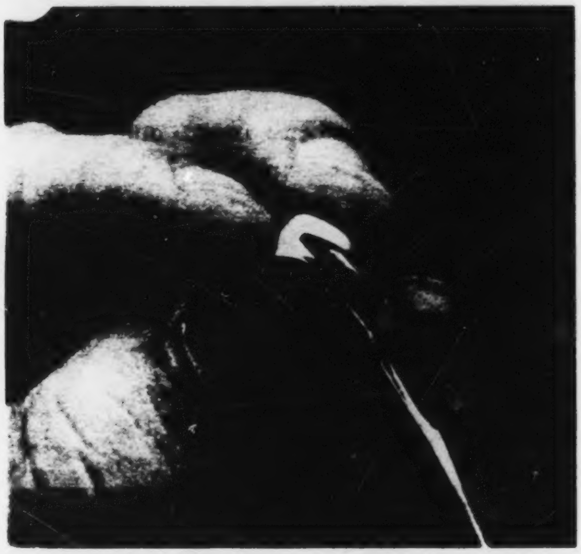
Remove the crown from the preparation, and use the curved crown and bridge scissors to trim the crown margin to the scribed line. Begin trimming at a line angle (the junction of two horizontal adjacent tooth surfaces, such as mesial and facial), making sure that the curve of the blades follows the curve to be trimmed (Figure 11). Trim the interproximal areas of the crown with the same contours as the interproximal area of the preparation finish line. Use care not to cut the margin too short. Any sharp curve left after cutting must be blended into a smooth line.

FIGURE 10
PREPARATION FINISH LINE AND THE TRIM LINE



The crown is held high as a trim line replicating the reparation finish line is scribed on it.

FIGURE 11
CURVED SCISSOR BLADES AND THE TRIM LINE



The curved blades of the scissors follow the curve of the trim lines

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When the crown is trimmed, replace it on the preparation and inspect the margin of the crown to see how it conforms to the finish line. Check this by holding the explorer firmly against the finish line and then following along its contour. The crown margin should coincide with the finish line. Check that the marginal ridges of the crown are at or within 0.5 mm occlusal to the marginal ridges of the adjacent molars.

Criteria

a. Crown is trimmed so that its margin meets and conforms to the contours of the preparation finish line.

b. Crown margin is free of sharp edges.

c. Occlusal plane of crown is at or 0.5 mm occlusal to that of the adjacent teeth.

5. REDUCE THE CIRCUMFERENCE OF THE CROWN MARGIN.

When a crown fits the mesio-distal space, it will probably not fit the gingival margin of the preparation. To reduce the circumference of the crown margin, use a pair of contouring pliers to crimp (bend inward) the edges of crown. While the crimping reduces the marginal circumference, the action of the pliers tends to distend the crown walls immediately occlusal to the margin. Besides reducing the circumference of the crown with crimping, the length of the crown is also reduced.

Use the contouring pliers to crimp inwardly and evenly around the gingival third of the crown until the crown fits snugly against the margin of the preparation. Work in small increments in order to maintain the general contour of the crown walls.

Check the marginal adaptation of the crown by placing it over the preparation, and with a finger on the occlusal surface move the crown in a facio-lingual direction, noting where additional crimping is needed. Use the explorer tip in a gingivo-occlusal direction to determine where there is space between the crown and the preparation. You will notice only a slight catching as the explorer tip moves from enamel to aluminum if the margin is well-fitted. If the explorer catches in a space under the crown, more crimping is required. Interproximal areas of the crown margin are particularly difficult to check and need careful attention. Continue to crimp and check the crown on the preparation until the crown fits firmly against the finish line of the preparation. When the marginal circumference of the crown is sufficiently reduced, a slight clicking sound is produced when it contacts the preparation margin. Caution: There is also a clicking sound when the crown is too long and snaps over the margin.

Criteria

a. Crown margin conforms to the contour of the preparation finish line.

b. Crown walls show no convexities or distensions.

6. SMOOTH THE EDGES OF THE CROWN.

Use the straight handpiece and a sandpaper disc with short, light strokes to smooth any rough edges on the crown margin. Figure 12 shows the thumb-to-thumb finger rest and the angle the disc should make with the crown margin. Clean all debris from the crown.

Criterion

a. Crown margin is a smooth curve free of sharp edges and debris.

FIGURE 12
THUMB-TO-THUMB FINGER REST

A proper angle of disc to margin and a stable thumb-to-thumb rest are important for smoothing the crown's edge.

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7. **DEVELOP THE CROWN'S OCCLUSAL ANATOMY**.

Seat the crown on the preparation, and close the mandible into centric occlusion with slight pressure. The opposing teeth should impress and shape the occlusal surface of the crown. Take care to exert only slight force, as excessive pressure will deform the crown. In a later step, the crown will be filled with cement so the final occlusal features can be safely developed with slightly more pressure.

Criterion

a. Preliminary occlusal anatomy of the crown is impressed on the crown.

8. **CHECK OCCLUSION**.

Clean and dry preparation, and use the air jet to dry all other teeth.

Place articulating paper between the arches, and tap the teeth into centric occlusion. Examine the teeth in the quadrant for markings; at least one point of contact should be present on each tooth. Compare with pre-preparation markings. If there are more and/or darker marks on the crown than were perceived at the pre-preparation check, or if only the maxillary teeth and the temporary crown show marks from the articulating paper, the crown is in supraocclusion (too high). To reduce the heights of the crown, trim, re-crimp, smooth the margin, clean the crown, and check the occlusion again. If no marks register on the crown, it is in infra-occlusion (too low), and you must fit a new crown.

Criterion

a. Pre-preparation occlusion is replicated, and all the teeth, including the crown, produce at least one occlusal contact mark of the same intensity as they did in the pre-preparation check.

9. **CHECK CONTACTS**

Check for proximal contacts by passing a length of dental floss through both the mesial and the distal contact areas. The floss should meet some resistance, but should snap through the contact areas. Remove floss through the embrasure, so as not to dislodge the crown.

If there is no contact, remove the crown. Place the crown on a paper pad for cushioning, and with the ball end of the T-ball burnisher, impress an ovoid shape on the inner surface of the middle third of the crown slightly toward the facial surface. The burnishing will stretch the aluminum outward, to produce a convexity and establish contact. Replace the crown, and recheck.

If a contact is too tight, use contouring pliers to bend and flatten the contact area. If the marginal area is deformed during this process, some re-crimping may be necessary.

Criterion

a. Interproximal contacts are established between the crown and the adjacent teeth.

10. SMOOTH CROWN

When you are satisfied that the crown meets all criteria related to margin, contacts, and occlusion, use a rubber wheel impregnated with pumice in the handpiece to smooth the margin. Polish off any written identification on the crown, taking care not to deform any contours. Use the air jet to clean the crown of debris.

Criterion

a. The crown has a smooth margin and is free of debris.

11. CEMENT TEMPORARY CROWN ON PREPARATION

Lubricate the exterior of the crown with petroleum jelly so excess cement will be easier to remove. Rinse and air dry the preparation but do not desiccate the tooth. When working with a patient, it is necessary to place a cotton roll between the cheek and the preparation and another between the tongue and the preparation, to keep the tooth dry (cement will not adhere if the preparation is too moist).

Prepare a mix of temporary cement according to the manufacturer's directions. When the cement is of uniform consistency and flows slowly from the end of the spatula, coat all internal surfaces of the crown. Add additional cement so that the crown is from one-third to one-half full.

Place the crown in its predetermined position on the preparation; use the marginal ridges of the adjacent teeth as a guide for proper seating then use an explorer to check that the crown is seated. Gently bring the mandible into occlusion and maintain centric occlusal contact until the cement sets. This contact will further shape the occlusal surface of the crown. Avoid excess pressure, as it can produce infra-occlusion.

The cement is set when the tip of the explorer does not penetrate its surface. After the cement has set, use an explorer to carefully remove all excess cement from interproximal areas and the gingival margin. Since small chips of cement can easily get embedded in the gingival sulcus, remove the excess cement in the largest pieces possible. Floss the contact areas to remove any cement chips in the proximal areas, adding a knot to the floss will help. Remember to remove the floss and move it laterally not up through the contact.

Remove the cotton rolls, and thoroughly rinse and dry the restoration area.

Criteria

a. Crown contacts with the adjacent: mesially, distally.

b. Facial and lingual surfaces are in the same plane as the adjacent teeth.

c. Crown margins:
-Ranges from the preparation finish line to 0.5 mm occlusally of the finish line.
-Fits snugly against he finish line.
-Is sealed with cement.

d. Excess cement removed from interproximal and gingival areas.

12. MAKE FINAL CHECK FOR OCCLUSION

Place articulating paper between the teeth, and perform a post-cementation check of the occlusion of the entire arch. Should the crown be in infra-occlusion, it will be necessary either to remove it and re-contour its occlusal surface or to adapt a new crown form.

Criteria

a. There is at least one centric mark on the crown that is of the same intensity as those on the adjacent teeth.

b. There is at least one centric mark on each tooth.

SUMMARY OF PROCEDURES AND CRITERIA

Procedures	Criteria
1. Measure mesio-distal space at the contact area, and select the crown.	a. Procedure complete.
2. Try the crown, and check its fit.	a. The crown fits the mesio-distal space. b. Facial and lingual contours of the crown are in the same planes as those of the adjacent teeth. c. Crown margin meets or extends gingivally from preparation finish line. d. The occlusal surface and the marginal ridges of the crown are in a plane with, or within 0.5 mm occlusal to, the occlusal surface and the marginal ridges of the adjacent molars.
3. Scribe a trim line on the crown that follows the finish line contour.	a. Trim line scribed along the marginal area of the crown.
4. Adjust the length of crown.	a. Crown is trimmed so that its margin meets and conforms to the contours of the preparation finish line. b. Crown margin is free of sharp edges. c. Occlusal plane of crown is at or 0.5 mm occlusal to that of the adjacent teeth.
5. Reduce the circumference of the crown margin.	a. Crown margin is crimped to hug the preparation finish line. b. Crown walls show no convexities or distensions.
6. Smooth the edge of the crown.	a. Crown margin is a smooth curve free of sharp edges and debris.

7.	Develop the crown's occlusal anatomy.	a.	Preliminary occlusal anatomy of the crown is impressed.
8.	Check occlusion.	a.	Pre-prepared occlusion is replicated, and all the teeth, including the crown, produce at least one occlusal contact mark of the same intensity as they did in the pre-preparation check.
9.	Check contacts.	a.	Interproximal contacts are established between the crown and the adjacent teeth.
10.	Smooth crown.	a.	Crown has a smooth margin and is free of debris.
11.	Cement temporary crown on preparation.	a.	Crown contacts with the adjacent teeth: distally, mesially.
		b.	Facial and lingual surfaces are in the same plane as the adjacent teeth.
		c.	Crown margin: -Ranges from the preparation finish line to 0.5 mm occlusally of the finish line. -Fits snugly against the finish line. -Is sealed with cement.
		d.	Excess cement removed from interproximal and gingival areas.
12.	Make final check for occlusion.	a.	There is at least one centric mark on the crown that is the same intensity as those on the adjacent teeth.
		b.	There is at least one centric mark on each tooth.

EVALUATION FORM
PREFORMED ALUMINUM TEMPORARY CROWNS

Student:______________________

Date:_________

Grade:_________

2 = Acceptable
1 = Improvable
0 = Unacceptable

	Instructor Trial 1	Self Trial 1	Instructor Trial 2	Self Trial 2
1. Crown contacts with the adjacent teeth:				
Distally	______	______	______	______
Mesially	______	______	______	______
2. Facial and lingual surfaces are in the same plane as the adjacent teeth.	______	______	______	______
3. Crown Margins meet preparation 0.5 mm of the finish line Buccal/Lingual	______	______	______	______
4. Fits snugly against the finish line.	______	______	______	______
5. All centric marks are consistent on each tooth (same intensity as adjacent teeth	______	______	______	______
6. Crown surfaces are smoothed	______	______	______	______
Crown fitted within reasonable time limit.				
Trial 1, 55 minutes (2 errors or less acceptable)	______	______	______	______
Trial 2, 30 minutes (3 errors or less acceptable)	______	______	______	______

STUDY QUESTIONS

1. What advantages does a temporary aluminum crown have over other preformed crowns?
2. What measurement is a major consideration in determining which size crown to use?
3. Why is it important that the margin fit well?
4. What functions does the temporary cement serve, other than adhering the crown to the preparation?
5. What criteria determines whether a temporary aluminum crown is properly placed?

PRACTICE

This section will help you learn the skills you will need in order to produce and evaluate preformed aluminum temporary crown restorations. Complete each activity independently or with the direction of your instructor. Be sure to ask the instructor for assistance if you need it. Feel free to use the magnifying glass to examine the features preparation.

Model Study

List of Models for Study

a) Temporary aluminum crown contoured and adjusted for prepared tooth #18, not cemented, all criteria met; with prepared tooth.

b) Temporary aluminum crown on prepared tooth #18, with the following deficiencies:

Distal surface:	crown extends beyond finish line.
Lingual surface:	crown margin is 0.8 mm short of finish line.
Facial surface:	insufficient crimping at margin.

1. Examine the unprepared mandibular and maxillary left second permanent molars. Notice the anatomical features of the occlusal surfaces, as well as the convex curve of the facial surfaces, especially in the gingival third. Identify the cusps, ridges, and fossae of the teeth.

   Occlude the two arches, and look at the relationship between the teeth. Notice particularly that the maxillary facial cusps and the mandibular lingual cusps do not make contact.

   Use articulating paper to locate the centric markings (there must be one centric mark on each tooth). If the appropriate centric markings do not occur, articulate the dentiform.

   Use dental floss to check that there are mesial and distal contacts.

   Also observe the facial and lingual contours of the arches with the mirror, and note how the second molars are placed in those arcs.

2. Examine a selection of aluminum crowns for molars and premolars, and identify the differences in occlusal contour as well as in size. Practice orienting the crowns to the teeth until you feel confident that you can easily tell the lingual cusps from the facial cusps. Note the malleability of the aluminum.

3. Examine the prepared tooth in the dentiform, and visually locate its finish line with the magnifying glass. Use the mouth mirror and the explorer to trace along the finish line, observing its contour, especially interproximally. Notice the curve of the chamfer, which widens towards the gingiva to ensure a tight seal.

4. Examine the model of the finished crown with a magnifying glass, and note particularly the finish line of the preparation and the adaptation of the margin of the crown to the finish line. Pull the explorer in a gingivo-occlusal direction to feel the texture of the seal, and to feel whether it is complete.

   Examine models and review the criteria listed on the Evaluation Form to test your understanding of the criteria.

5. Examine the model of the crown that has met all the criterion. Place and remove the crown to get "the feel of the fit" and to learn to recognize the feeling and the sound when a crown is seated.

6. Compare the models of finished crowns that do and do not meet the criteria. Hold each model, looking at the mesial surface, and note the slight marginal convexity of the crimped crown on its facial and lingual surfaces and compare it to the uncontoured surface of the unfinished crown. Identify any deficiencies you can in the models, and be sure you understand what procedures may have caused them, as well as how they can be corrected. The consequences of such errors should be clear to you.

7. If you are inexperienced in working with metal, take a piece of metal matrix material and practice cutting smooth curves. Place the metal on a paper pad, then use the T-ball burnisher to make a slight indentation in the metal.

8. Your instructor will help you assemble your low-speed handpiece. If you are not familiar with its operation, listen to its sound at different speeds, and practice changing discs. Ask for assistance in mastering any other instruments with which you are not familiar.

9. You should understand and be able to visualize the following concepts before beginning the procedure:

    a. chamfer
    b. finish line
    c. mesial/distal contacts
    d. snug fit
    e. centric occlusion
    f. facial/lingual contour
    g. 0.5 mm
    h. embrasure

10. Use the mouth mirror to practice sighting across the lingual surfaces of the anterior and posterior teeth. Hold the mirror distal to the portion being viewed, and look across the teeth mesio-distally. Hold the mirror on the facial or lingual sides to view the incisal or occlusal edges (occlusal plane) of both maxillary and mandibular teeth. Practice holding your mirror in different positions to view the lingual, facial, and occlusal surfaces of the teeth. Position the mirror, rather than your head, to provide the best possible view. Ask your instructor for assistance with these techniques, as they will help you seat and align the crown.

11. With the dentiform, open and close the arches into centric occlusion. Observe the tooth-to-two-teeth occlusal pattern of the posterior teeth. Check the occlusion of the arches to be sure that at least one centric mark appears on all teeth but the incisors.

12. Practice checking contacts on the dentiform, to familiarize yourself with the feeling of dental floss snapping through. Always remove the floss laterally through the embrasure.

Crown Adaptation and Evaluation

1. Review the video tape.

2. After making the first occlusal check, remove the tooth carefully, taking care not to disturb the blue occlusal marks. That occlusal pattern must be replicated when the crown is seated, the tooth will help you refresh your visual memory.

3. Place the prepared tooth in the dentiform. When progressing through the numbered procedures, read each one in its entirety before beginning to follow that procedure. Explanations are intermingled with directions throughout the steps, and it is helpful to have a sense of the whole process before you make any attempt to place the crown.

4. Perform all the steps in placing the crown, up to the point at which it is ready to be cemented. Evaluate your placing of the crown in the dentiform on the Evaluation Form, then

request evaluation from the instructor. Correct any features of the crown that are marked "improvable," and re-evaluate. If the crown is marked "not acceptable," make a note of that result after "Explanation of Errors," and select a new crown for fitting. When you and the instructor agree that all criteria have been adequately met, practice mixing the cement. Your instructor will inform you as to whether to cement the crown on the dentiform or not.

6. You will be given 55 minutes to complete your first trial. Your instructor will limit your second trial to 30 minutes, to help increase your speed and to simulate a clinical experience. Practice the procedures until you produce at least one crown restoration that meets the criteria.

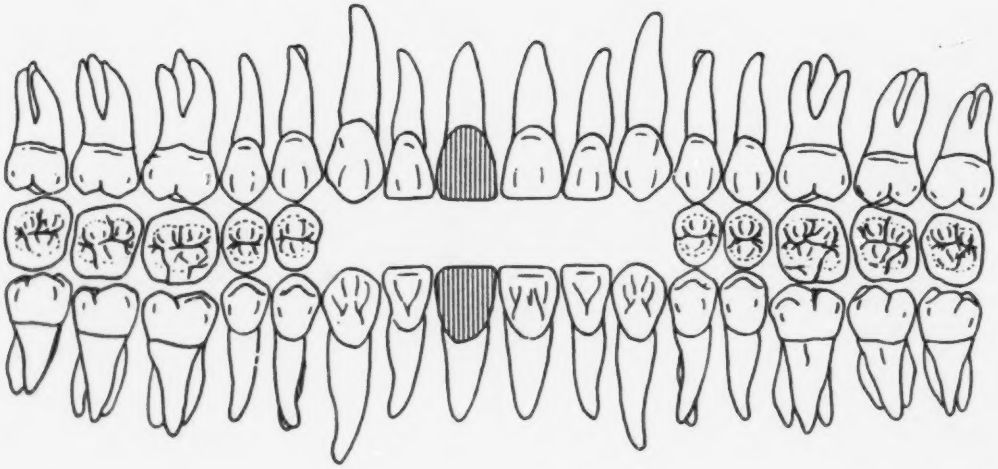
7. After you complete the procedure, evaluating other students' work will help you develop your visual discrimination.

PREPARATION FOR MODULE 3

1. Examine pre-prepared tooth #8.
2. View the videotape for Module 3.
3. Read the Module 3 Syllabus.
4. Familiarize yourself with the criteria and the evaluation form.
5. Answer the Study Questions, to check your background knowledge.

module 3

placing a preformed plastic temporary crown



MODULE 3

PLACING A PREFORMED POLYCARBONATE TEMPORARY CROWN

The crown used in this module is polycarbonate (a form of synthetic resin). This material is widely used for temporary crowns for several reasons: it is strong yet flexible enough to contour easily; it bonds chemically to a self-curing acrylic resin material used to fill the shell. Although plastic crowns do not bend and draw as metal crowns do, they have almost perfect bonding properties. Any area of a plastic crown, including the incisal edge, can be extended by adding layers of acrylic and smooth them.

Plastic crowns are commercially produced to conform to standard surface contours of teeth and are available in a range of sizes sufficient to cover most preparations. Although the manufacturers have no sizing convention, the sizes of most polycarbonate crowns vary by increments of approximately 0.5 mm mesio-distally. Incisal crowns, when fitted to preparations mesio-distally, are generally too wide facio-lingually.

In this module the maxillary right permanent central incisor (#8) is to be temporarily restored with a preformed polycarbonate temporary crown. The tooth has been prepared for a permanent porcelain-fused-to-metal crown. Figure 13 presents facial and mesial views of the unprepared tooth and the prepared tooth with a crown.

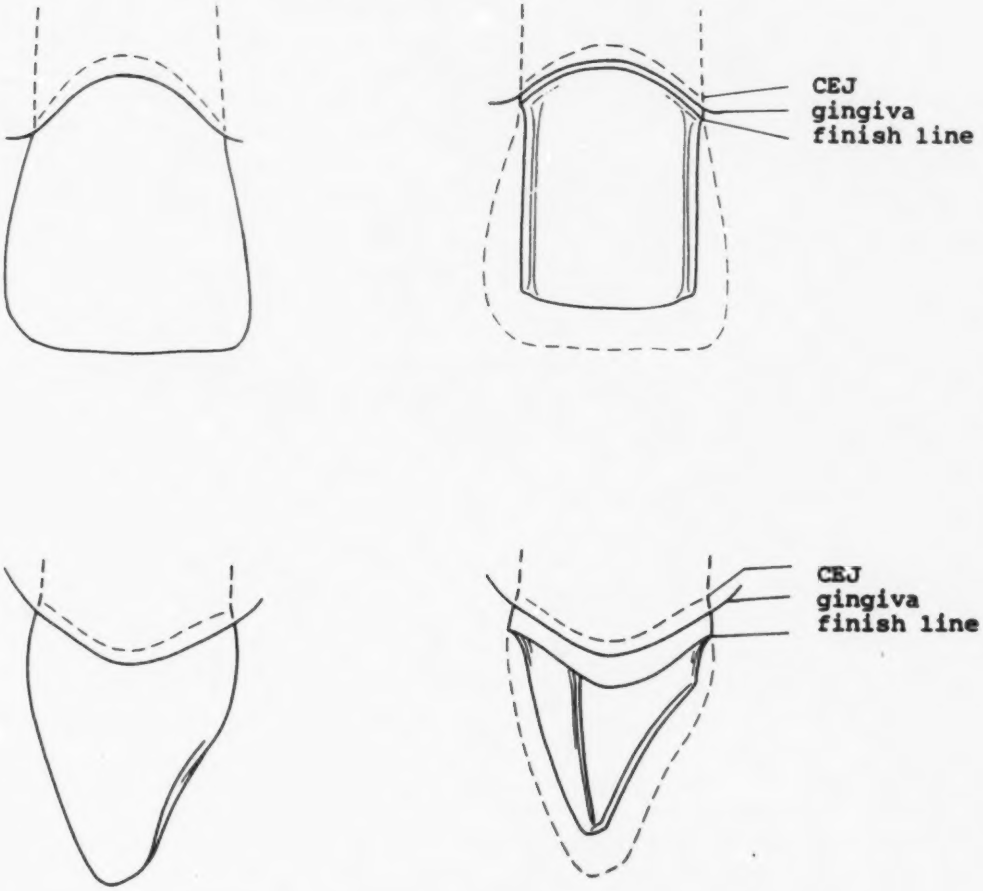
Overview of Procedure

The procedure for temporarily restoring this tooth with a preformed plastic crown begins and ends with occlusion checks. After occlusion is checked, a preformed plastic crown that will cover the prepared tooth and contact the adjacent teeth is selected. The size of the crown is determined by measuring the space between the mesial and distal contacts of the tooth with a Boley gauge.

As the plastic shell is placed over the tooth, it will be immediately obvious that the internal form of the crown does not approximate that of the preparation. The crown must be in place, marked and trimmed until the crown margin conforms to the contour of the finish line of the preparation. An acrylic resin is then mixed and placed in the crown, which is subsequently seated on the preparation. The viscous resin fills the spaces between the prepared tooth and the crown and as the acrylic resin hardens, the contours of the pre-prepared tooth are replicated. With the crown in place, occlusion is checked; then extra resin removed, the margin of the crown trimmed, the incisal length adjusted, and contacts established. Finally, the crown is cemented in place and a last occlusion check is made.

Success in placing this crown depends on careful trimming and contouring of the polycarbonate crown shell and the acrylic resin.

FIGURE 13
FACIAL/MESIAL VIEWS OF TOOTH #8



Facial (at top) and mesial view of tooth #8, unprepared and prepared.

ARMAMENTARIUM

1. articulating paper and holder
2. prepared tooth #8
3. assortment of preformed polycarbonate temporary crowns for tooth #8
4. explorer
5. dental mirror
6. round bur (#6 or #8)
7. flame-shaped acrylic bur
8. green stone
9. sharpened soft lead pencil (#1)
10. curved crown and bridge scissors
11. cotton rolls
12. lubricant (petroleum jelly or cocoa butter)
13. 4 dappen dishes
14. acrylic resin kit
15. spatula (#7)
16. gauze pads (2" x 2")
17. excavator
18. towel clamps (Backus)
19. magnifying glass
20. small camel's-hair brush
21. boley gauge or micrometer caliper
22. unwaxed dental floss
23. mandrels (Moore's)
24. coarse garnet disc (3/4")
25. fine cuttle disc (3/4")
26. fine pumice (optional)
27. buffing wheel (optional)
28. temporary cement kit
29. mixing pad
30. double-ended plastic instrument

PROCEDURES

Preliminary Procedure

Before the temporary plastic crown placement procedure is begun on a patient, the anterior maxillary quadrant should be thoroughly cleaned to remove plaque and debris, the occlusion of the quadrant should be checked, and maxillary right central incisor #8 should be prepared for ultimate placement of the porcelain-fused-to-metal permanent full crown.

1. Check the Armamentarium to be sure you have all the necessary supplies and equipment.

2. Remove the unprepared tooth from the dentiform after checking occlusion, and set it aside for later reference. Note whether the tooth was in occlusion.

3. Place the prepared tooth in the dentiform.

Crown Placement Procedure

1. **MEASURE THE MESIO-DISTAL SPACE BETWEEN THE CONTACT AREAS, AND SELECT THE CROWN.**

   With a micrometer caliper (or boley gauge), measure the space between the mesial and the distal contact areas of the tooth #8 at the level of the incisal third of the adjacent teeth. From the selection of sample crowns, choose a crown that is the same size or wider than the space. (A wider crown ensures an adequate lining of acrylic all around the preparation.)

   To facilitate placing on and removing the crown from the preparation, maintain the tab on the incisal edge.

   Criterion

   a. Procedure completed.

2. **TRY THE CROWN FOR FIT, AND ADJUST THE BINDING.**

Gently press the crown over the prepared tooth; keep the facial surface in the same plane as those of the adjacent teeth. There should be enough clearance between the preparation and the crown to allow the crown margins to reach the finish line of the preparation. Almost any crown will need adjustment to fit; following are some of the common problems and solutions.

a. If the crown fits mesio-distally, but is too tight internally preventing the crown from meeting the preparation finish line, use a round bur in a straight handpiece at low speed to adjust the interior of the crown. You may need to place and remove the crown several times to determine the exact point of binding; take care to place the crown in exactly the same position each time you place it on the preparation.

b. If the crown should bind at the preparation's finish line, increase the marginal diameter with an acrylic bur. Determine with an explorer the exact place of binding, usually in an interproximal area.

c. If the proximal surfaces of the crown bind on the adjacent teeth, but a smaller preformed crown is too narrow to make contact, remove a small amount of plastic from the contact areas with an acrylic bur in the straight handpiece. Should you accidentally perforate the plastic crown, you can correct it later by adding acrylic.

d. When the crown has been adjusted to fit mesio-distally, there usually remains several other adjustments to be made. Typically the crown extends gingivally over the finish line, is longer at the incisal edge than the adjacent tooth and is too wide facio-lingually at the finish line. Don't expect a perfect fit too soon; these adjustments will be made later in the procedure.

Criteria

a. Crown fits the mesio-distal space of the tooth to be restored.

b. Crown fits over preparation without binding.

c. Crown contacts adjacent teeth.

3. ADJUST GINGIVAL LENGTH OF MARGIN AND MARGINAL CONTOUR OF CROWN.

In this step, the margin of the crown will be grossly trimmed; final fitting will take place after the crown has been lined. The crown margin should be just gingival to the finish line so that the acrylic lining will be able to flow freely, extruding all around the margin and thus reproducing the finish line of the preparation.

Study the contour and location of the finish line, place the crown over the preparation and with a sharpened soft lead pencil mark the finish line. Remove the crown and with the curved crown and bridge scissors, begin trimming the gingival margin of the crown at the facial. Cutting carefully toward the proximal, trim only a small amount of plastic at a time, since cracking or outright fracture of the crown sometimes results if large pieces are cut. Place the crown on the tooth occasionally to check how closely the margin conforms to the finish line.

This same procedure can be achieved with the acrylic bur in the straight handpiece, holding the handpiece in a palm grasp. Assume a thumb-to-thumb finger rest; trim, thin, and smooth the crown margin until it is smooth and of uniform thickness. When the crown is in place over the preparation, the preparation finish line should be just visible where the crown margin meets the prepared tooth. Use the mouth mirror to view the lingual marginal area. Replace the crown on the tooth occasionally to check how closely the margin conforms to the finish line.

It is important to seat the crown in the same position each time you try it on the preparation. The adjacent central incisal edge and facial surface can serve as guides for this. When you line the crown up on any one plane, you should sight from two vantage points 90 apart; for example, view the facial plane from the incisal edge and from the distal side.

Criteria

a. Crown margin fits over preparation.

b. Crown margin approximates the finish line contour and extends slightly gingival to the finish line.

c. Crown margin is smooth and of uniform thickness.

d. Major areas that will need re-contouring are noted.

4. CLEAN AND DRY THE PREPARATION AND CROWN, ISOLATE THE AREA, AND LUBRICATE THE PREPARATION AND THE ADJACENT TEETH.

Clean and dry the preparation with water and a flow of air. Clean all debris from the crown, and dry the crown with air pressure. Since moisture will interfere with acrylic polymerization, place a cotton roll between the lip and the gingiva. To prevent the acrylic from adhering to the preparation, the adjacent teeth and the gingiva, coat a cotton roll with some petroleum jelly and lubricate the areas. Remember that the lubricant will contaminate the acrylic resin during polymerization so that it will not bound properly with any additional acrylic resin you might wish to add later.

Criterion

a. Procedure completed.

5. **FILL THE CROWN WITH ACRYLIC RESIN, AND SEAT IT ON THE PREPARATION.**

Seat the crown on the preparation in the exact position for which the margin has been trimmed, and note its alignment. Once it is fully seated, hold the facial surface of the crown flush with that of the adjacent central incisor for correct positioning. This position will have to be duplicated when the crown is filled with acrylic resin.

For the placement of the crown, it is assumed that a larger quantity of acrylic resin will be needed. Follow the manufacturer's directions exactly. Place a few drops of monomer in a dappen dish and add polymer; mix the monomer and polymer with a spatula or tap on the counter to incorporate thoroughly and to eliminate air entrapment. When the resin mix has a creamy consistency, use a spatula to apply a thick coat to the interior of the crown. Begin at the incisal depth of the crown, filling carefully so bubbles do not form. Coat the walls thoroughly, filling the crown until there is only a shallow concave surface of acrylic resin at the marginal end of the crown. Avoid overfilling the crown.

When the acrylic resin loses its highlights and surface shine (after about 1 minute), seat the crown on the prepared tooth, taking care not to rotate it from its correct position. Hold the facial and incisal surface stable with your forefinger on the crown and the adjacent central incisor for 2 or 3 minutes. Be especially careful to guard against mesial and distal rotation.

The acrylic resin will fill the space between the crown and the preparation and the excess will flow gingivally covering the finish line.

If only a small amount is needed to fill a void or to extend a contact area, the bead-brush or the brush-flow technique is recommended. For this, you line up three dappen dishes, shallow end up. Place a drop or two of monomer in each of the first and second dishes (one of these is for rinsing the brush) and a little polymer in the third dish. Dip the brush in the monomer; then touch it to the powder, to form a bead on the tip of the brush. Brush the bead onto the crown where it is needed, and smooth it in place with the brush. Rinse the brush in the rinsing dish of monomer, and wipe it on a piece of gauze before dipping it into the clean monomer and then into the polymer again, to form another bead; and apply it as before.

Criteria

a. Polymer and monomer are mixed thoroughly to a cream consistency.

b. Crown interior is almost completely filled with acrylic resin, which forms a shallow concave surface at the marginal end of the crown.

c. Crown is fully seated on the preparation, with its facial surface flush with that of the adjacent central incisor.

d. Resin has extruded over the finish line.

6. REMOVE CROWN AND TRIM AWAY EXCESS ACRYLIC RESIN.

Excess acrylic resin must be removed from the crown before it is completely hard to prevent the crown from binding interproximally. If the acrylic resin hardens before trimming, the crown or the tooth may break when you attempt to remove the crown. Use the explorer to check the consistency of the excess resin at the margins. When the resin has become doughy (when it does not run and has little stretch to it), remove the crown from the tooth. Using the crown and bridge scissors, trim away the excess acrylic resin.

Criterion

a. Margin is free of gross excess resin.

7. RESEAT CROWN WHILE POLYMERIZATION IS COMPLETED.

Immediately reseat the crown. Stabilize the crown with your finger. Test the marginal acrylic resin with the explorer. At this point, you may want to take the crown on and off the preparation a few times. When the explorer cannot indent the acrylic resin, polymerization is complete.

Remove the crown. Should this be difficult, use a piece of gauze to get a purchase on the crown. If the crown still does not unseat, gently pry around the margin with an excavator. If needed, use Backus towel clamps to pull the crown off.

Use a magnifying glass to examine the internal surfaces of the crown and the marginal area. The preparation and the finish line should be replicated; acrylic resin should be free of large voids. If 95% of the finish line is not successfully replicated, fit a new crown; small voids can be filled.

Replace the crown over the preparation. It should fit snugly, and it should resist if you try to move it with your finger.

Criteria

a. Acrylic resin liner has polymerized; it is hard.

b. The preparation and at least 95% of the finish line is impressed in the acrylic resin.

c. Acrylic resin liner is free of large voids.

d. Crown fits preparation snugly without binding.

8. TRIM CROWN MARGIN.

Remove the crown. Locate the impressed finish line of the preparation on the interior of the crown, mark it with a sharpened, soft lead pencil.

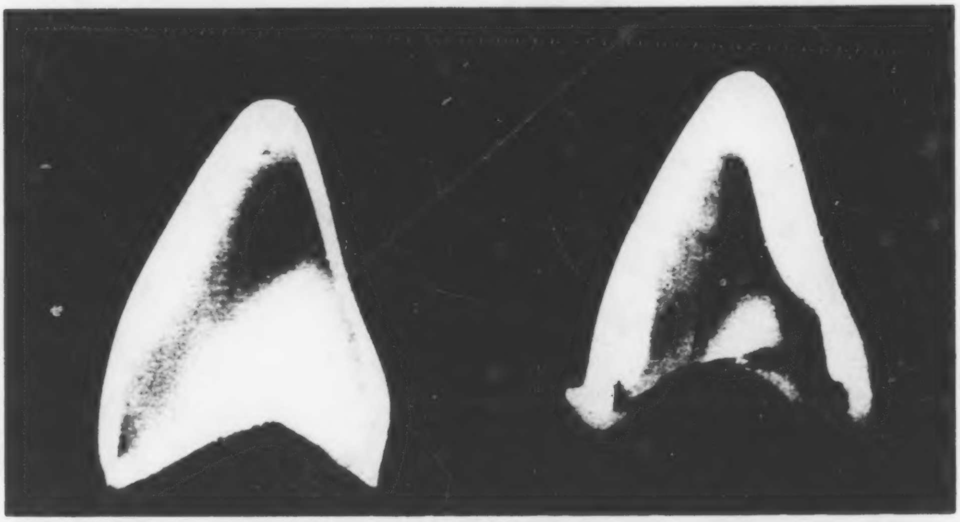
Figure 14 shows two sectioned crowns; one is unlined, the other lined. The pencil line indicates the impressed finished line of the preparation. Use an acrylic bur to trim the resin that extends gingival of the finish line. Short intermittent strokes of the bur will reduce softening and tearing of the resin. As you trim the margin, clean away the debris and place it occasionally on the preparation until the margin conforms to the finish line.

Criteria

a. Crown margin meets preparation finish line exactly.

b. Crown is clean of debris.

FIGURE 14
CUTAWAY OF UNFINISHED PREFORMED PLASTIC CROWN SHELLS



Cutaway of unfinished preformed plastic crown shells, right trim line marked on lined shell.

9. ADJUST OCCLUSION, INCISAL LENGTH, FACIAL AND LINGUAL CONTOURS AND FACIO-LINGUAL WIDTH OF CROWN.

Gross occlusal adjustment is necessary at this time. For this step, first dry the prepared area, the crown, the adjacent maxillary teeth, and the opposing mandibular teeth. (Articulating paper will not mark a wet surface.) Seat the crown, place blue articulating paper between the maxillary and the mandibular incisors, and gently tap the teeth together. If the mark on the crown is heavier than the mark on the unprepared tooth (as it is likely to be), the lingual surface of the crown is too thick. Thin that area at the blue mark using the acrylic bur in the straight handpiece at low speed. After using the bur, use gauze to wipe all traces of blue from the teeth. Check occlusion again, and repeat the procedure until the crown occlusion replicates the occlusion of the unprepared tooth.

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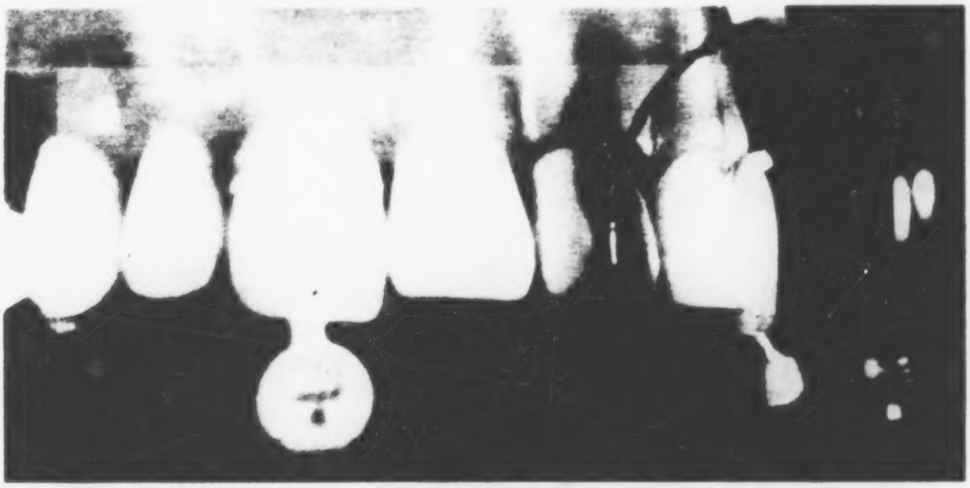
To check the incisal length of the crown, be sure the crown is fully seated, and compare the location of its incisal edge with that of the adjacent central incisor. Use a sharpened, soft lead pencil to draw a line from mesial to distal across the facial surface of the crown, indicating where to trim. Remove the crown from the preparation, and break off the tab. Use the acrylic bur at low speed to trim the areas that require reduction. In some areas it may be necessary to trim away the plastic shell entirely and contour the underlying acrylic resin. Reseat the crown frequently to reassess the contours.

Use the mirror to compare the facial contour of the crown with that of the other central incisor (Figure 15). Hold the mirror to the distal of the lateral as you sight across the central incisors. Use a pencil to shade any area that needs reduction or addition.

FIGURE 15
USE OF THE MOUTH MIRROR TO COMPARE
CROWN FACIAL CONTOURS



The crown's facial contours can be compared with those of the adjacent teeth by using the mouth mirror.

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From the fitting and lining procedures it was apparent that the lingual surface was too thick and required the most trimming. In the majority of clinical situations, the finish line is subgingival and the contour is critical because over-contouring in the area can cause gingival irritation and patient discomfort. Take time to examine the marginal area on the lingual surface carefully with the mirror and explorer. Check for any overhang that catches the explorer, and use various sighting techniques to compare the overall contour of the crown with that of the adjacent central incisor. Again, use a pencil to shade any areas that need adjustment.

Compare the facio-lingual width of the incisal edge of the crown with that of the other central after you have adjusted the incisal length. Shortening a crown increases the width of the incisal edge enough that facial and lingual contouring may be necessary to reduce that dimension on the crown.

Criteria

a. Crown occlusion replicates the occlusion of the unprepared tooth.

b. Tab is removed.

c. Needed contouring is adjusted.

d. Crown is the same length gingivo-incisally as tooth #9.

10. REFINE INCISAL, FACIAL AND LINGUAL CONTOURS, FACIO-LINGUAL WIDTH, AND INTERPROXIMAL AREAS

If an area of the crown is under-contoured, acrylic resin may be added to the area by the bead-brush technique.

Last, inspect the crown for overall contour, and compare it to the adjacent central incisor. Check the interproximal contours in the gingival half, and remember that the patient's comfort and aesthetics depend upon your ability to reproduce the original, unprepared tooth.

Criteria

a. Crown margin exactly meets the preparation finish line.

b. Crown contour resembles that of tooth #9 facially, lingually, incisally, and interproximally in the gingival half.

11. **CHECK AND ADJUST THE CONTACTS OF THE CROWN WITH THE ADJACENT TEETH**.

Check the mesial and distal contacts of the crown with the adjacent teeth by using dental floss. If the floss encounters some resistance incisally but snaps through, the contact is well established. When no contact exists, use the bead-brush technique to add acrylic resin to the incisal third of the crown on the proximal surface. Allow the resin to become doughy, and then seat the crown till the acrylic hardens, to establish the contact. Next, remove the crown, and smooth any pits or bumps with the acrylic bur. Should the contacts be so tight that the floss cannot pass through, use the acrylic bur to trim the incisal third. Replace the crown, and check that both contacts have been adequately established.

Criterion

a. Mesial and distal contacts re-established.

12. **REFINE THE CONTOUR, AND POLISH CROWN SURFACES**.

While holding the crown in your hand, use the coarse garnet disc or acrylic bur in the handpiece with the thumb-to-thumb rest, to finish and refine the contour; exclude centric stops, crown margin, and interproximal contacts. Light pressure and intermittent strokes will minimize the generation of heat. Coat a fine cuttle disc with petroleum jelly, place it in the handpiece, and polish the crown until it is free of pits and rough areas or you may refine the crown surfaces on the lathe with a buffing wheel and a thin slurry of fine pumice.

Criterion

a. All surfaces, except centric stops, margin, and interproximal contacts, are smooth and polished.

13. **FINAL CHECK OF MARGINAL FIT, INTERPROXIMAL CONTACTS, AND OCCLUSION**.

Rinse and dry the crown with the water and air spray, to clean away all debris. Reseat the crown, and check with the explorer that its margin meets the preparation finish line. The explorer should catch only slightly when moved in a gingivo-incisal direction along the junction of the margin and the finish line.

Use dental floss to check again for the presence of interproximal contacts. Then recheck the occlusion. The occlusion marks (if any) should replicate those noted before the procedure was begun. Remove the crown.

Criteria

a. Crown margin exactly meets and fits the preparation finish line.

b. Mesial and distal contacts re-established.

c. Crown occlusion replicates the occlusion of the unprepared tooth.

14. CLEAN, DRY AND ISOLATE PREPARED TOOTH, AND LUBRICATE CROWN.

Isolate the anterior maxillary area with a cotton roll between the lip and the gingiva. With a cotton roll lubricate the exterior surfaces of the crown with a light coating of petroleum jelly or cocoa butter, to prevent excess cement from adhering to the crown. Caution: no lubricant should contact the surfaces to be cemented.

Criteria

a. Preparation is isolated with cotton rolls.

b. Crown exterior is lubricated.

15. CEMENT THE CROWN ON THE PREPARATION.

Prepare a mix of temporary cement according to the manufacturer's directions. When the mixture is of uniform consistency, use a plastic instrument to coat the internal surfaces of the crown evenly with only a thin layer of cement. Dry the preparation with light air or a dry gauze. Place the crown on the preparation, and check the margin with the explorer to see whether it is properly seated. Insert a cotton roll between the maxillary and the mandibular incisors, and bring the teeth together, holding them with moderate pressure for about 3 minutes until the cement sets. (You can remove the extruded cement with the explorer after it dries to the point where the tip of the explorer does not penetrate its surface.)

Criteria

a. Temporary cement is mixed to uniform consistency.

b. Interior of crown is coated with a thin layer of cement.

c. Dry the preparation with light air pressure or with a dry gauze.

d. Crown is fully seated on the preparation and held in place by a cotton roll between maxillary and mandibular incisors until the cement is set.

16. CLEAN AND DRY THE CROWN AND ADJACENT TEETH.

Remove excess cement from the interproximal areas, the margins, and the sulcus with the explorer and an excavator; the cement can cause considerable irritation. Use dental floss to free the contact areas of cement. A knot added to the floss will ease out interproximal cement. Wipe the restored tooth with gauze, remove the cotton roll, and wash and dry the entire area with the air/water spray.

Criterion

a. Restored tooth and surrounding area are free of excess cement and are clean and dry.

17. FINAL CHECK OF OCCLUSION AND MARGIN.

Check the occlusion with blue articulating paper. Check the marginal seal with the explorer. Should incisal prematurities appear, trim and polish with the fine discs, and then check again.

Criteria

a. Occlusion of the restored tooth replicated that of the unprepared tooth.

b. Crown margin is sealed.

SUMMARY OF PROCEDURES AND CRITERIA

Procedure	Criteria
1. Measure the mesio-distal space between the contact areas, and select the crown.	a. Procedure completed.
2. Try the crown for fit, and adjust any binding.	a. Crown fits the mesio-distal space of the tooth to be restored.
	b. Crown fits over preparation without binding.
	c. Crown contacts adjacent teeth.
3. Adjust gingival length and marginal contour of crown.	a. Crown margin fits over preparation.
	b. Crown margin approximates the finish line contour and extends slightly gingival to the finish line.
	c. Crown margin is smooth and of uniform thickness.
	d. Major areas that will need re-contouring are noted.
4. Clean and dry preparation and crown, isolate the area, lubricate the preparation and adjacent teeth.	a. Procedure completed.
5. Fill the crown with acrylic resin and seat it on the preparation.	a. Polymer and monomer is incorporated thoroughly to a creamy consistency eliminating air entrapment.
	b. Crown interior is almost completely filled with acrylic resin, which forms a shallow, concave surface at the marginal end of the crown.
	c. Crown is fully seated on the preparation with its facial surface flush with that of adjacent central incisor.
	d. Resin has extruded over the finish line.

6.	Remove crown, and trim away excess acrylic resin.	a.	Margin is free of gross resin.
7.	Reseat crown, and complete polymerization.	a. b. c. d.	Acrylic resin liner is set. Interior of the crown replicates the preparation and at least 95% of the finish line is reverse. Acrylic resin liner is free of large voids. Crown fits preparation snugly without binding.
8.	Trim crown margin.	a. b.	Crown margin meets preparation finish line exactly. Crown is clean of debris.
9.	Adjust occlusion, incisal length, facial and lingual contours, facio-lingual width of crown.	a. b. c. d.	Crown occlusion replicates the occlusion of the unprepared tooth. Tab is removed. Needed contouring is adjusted. Crown is the same length gingivo-incisally as tooth #9.
10.	Adjust incisal length, facial and lingual contours, facio-lingual width, and interproximal areas.	a. b.	Crown margin exactly meets the preparation finish line. Crown contour resembles that of tooth #9 facially, lingually, incisally, interproximally in the gingival half.
11.	Check and adjust the contacts of the crown with the adjacent teeth.	a.	Mesial and distal contacts re-established.
12.	Refine the contour, and polish crown surfaces.	a.	All crown surfaces, except centric stops, margin and interproximal contacts, are smooth and polished.

13. Final check of marginal fit, interproximal contacts, and occlusion.	a. Crown margin exactly meets and fits the preparation finish line. b. Mesial and distal contacts re-established. c. Crown occlusion replicates the occlusion of the unprepared tooth.
14. Isolate the prepared tooth, and lubricate crown.	a. Preparation is isolated with cotton rolls. b. Crown exterior is lubricated.
15. Cement the crown on the preparation.	a. Temporary crown is mixed to uniform consistency. b. Interior of crown is coated with a thin layer of cement. c. Dry the preparation with light air pressure or with a dry gauze. d. Crown is fully seated on preparation and held in place by a cotton roll between maxillary and mandibular incisors until cement is set.
16. Clean and dry the crown and the adjacent teeth.	a. Restored tooth and surrounding area are free of excess cement and are clean and dry.
17. Final check of occlusion and margin.	a. Occlusion of the restored tooth replicates that of the unprepared tooth. b. Crown margin is sealed.

EVALUATION FORM
PREFORMED PLASTIC TEMPORARY CROWNS

Name:______________________
Date:________
Grade:________

2 = Acceptable
1 = Improvable
0 = Unacceptable

	Instructor Trial 1	Self Trial 1	Instructor Trial 2	Self Trial 2
1. Crown contacts adjacent tooth:				
Mesially	______	______	______	______
Distally	______	______	______	______
2. Crown margins meet preparations with 0.5 mm of the finish line				
Buccal/Lingual	______	______	______	______
Interproximal: Mesial/Distal	______	______	______	______
3. Marginal ridge height of crown is acceptable with adjacent teeth				
Mesial	______	______	______	______
Distal	______	______	______	______
4. Crown contour resembles that of the original tooth				
Facial	______	______	______	______
Lingual	______	______	______	______
Incisal	______	______	______	______
5. Crown is smoothed and polished	______	______	______	______

Crown fitted within reasonable time limit.

	Instructor Trial 1	Self Trial 1	Instructor Trial 2	Self Trial 2
Trail 1, 1 hour (3 errors or less is acceptable)	______		______	
Trial 2, 40 minutes (4 errors or more is unacceptable)		______		______

STUDY QUESTIONS

1. What techniques are used to adjust the size of a temporary polycarbonate crown?
2. What indicates that a temporary crown is over-contoured on the lingual? On the facial?
3. Why must the crown be removed from the preparation before the acrylic resin filler is completely polymerized?
4. What difference would it make if the crown were a little over-contoured at the gingival third?
5. What difference would it make if the incisors were not in occlusion at the preparation check, but they were after the crown was cemented in place?
6. What is the function of the acrylic resin liner?
7. Why is it vital that the liquid of the acrylic filling be thoroughly incorporated with the powder?

PRACTICE

These preliminary exercises are intended to alert you to the nature of the polycarbonate crown and the acrylic resin you work with in this module, as well as familiarize you with some techniques designed to help beginning students avoid pitfalls.

Model Study

List of Models for Study

a) Temporary plastic crown contoured and adjusted for prepared tooth #8, all criteria met;

b) Temporary plastic crown, acrylic-lined, untrimmed and contoured.

c) Temporary plastic crown on prepared tooth #8, with the following deficiencies:

Lingual surface: marginal area heavily over-contoured

Incisal edge: trimmed to a stub, not smoothed

Facial surface: under-contoured in gingival third, pitted

1. Examine the unprepared right maxillary central incisor in place and out of the dentiform. Notice the contours and size of the tooth. Study the prepared tooth #8, and compare it to the unprepared tooth to see how much of the surface has been reduced. Use the magnifying glass to follow the finish-line contour and the vertical shoulders on the facial surface. Place the prepared tooth in the dentoform, and locate the finish line with the explorer and the mirror.

2. Compare the size and contour of a plastic crown shell with those of an unprepared tooth #8. Viewing both from the mesial, place the crown form behind the unprepared tooth, and notice the over-contouring of the crown, especially in the gingival third and on the lingual surface. Visualize the areas that will have to be reshaped if the crown is to replicate the unprepared tooth.

   Now compare the crown shell to the prepared tooth. Holding the crown over the prepared tooth, notice the excess length of the crown that will need trimming and the excess facio-lingual width that will be filled with acrylic and later recontoured. Hold the prepared tooth and the crown form up to a light, to see how far the crown seats on the preparation. You will need to develop a feel for all these dimensions; they are not visible when the tooth is in the dentiform.

3. Review the features of the prepared tooth, and identify the finish line and the vertical shoulders; visualize how much enamel and dentin have been removed.

4. Using the magnifying glass to locate the finish line that has been impressed on the untrimmed acrylic lining of the crown shell, visualize what trimming will be necessary in order to contour the crown margin.

5. Read the directions for mixing both the acrylic resin and the temporary cement you will be using. Mix the acrylic so you can observe how much heat is produced by the polymerization process. You may also want to practice the bead-brush technique for adding acrylic to the polycarbonate shell. Watch how the resin changes consistency as it polymerizes.

6. Study the ideal model of the restored tooth #8. Use the explorer to feel its marginal integrity, especially when the restoration is in the dentiform.

   Study each of the models while you hold them in your hand and when they are in the dentiform and note the deficiencies. Note particularly the lingual contour in the gingival third, and test how it feels with the explorer.

   Use the magnifying glass to examine the finish line that is imprinted in the acrylic-lined shell.

7. Ask for assistance from your instructor in learning to master any instruments you have not used before.

Crown Adaptation and Evaluation

1. Review the videotape. Note the following details as well as the procedure steps:

   a. Thumb-to-thumb finger rest.

   b. Angle of carbide bur to crown during trimming.

   c. Angle of discs to crown during finishing.

   - d. Amount of acrylic put in crown shell.
   - e. Texture of acrylic when doughy.
   - f. Amount of cement applied to crown shell.
   - g. Angle of explorer and mirror for marginal fitting checks.

2. After making the first occlusal check, note whether #8 is in or out of occlusion, and remember that you must replicate this position with your crown.

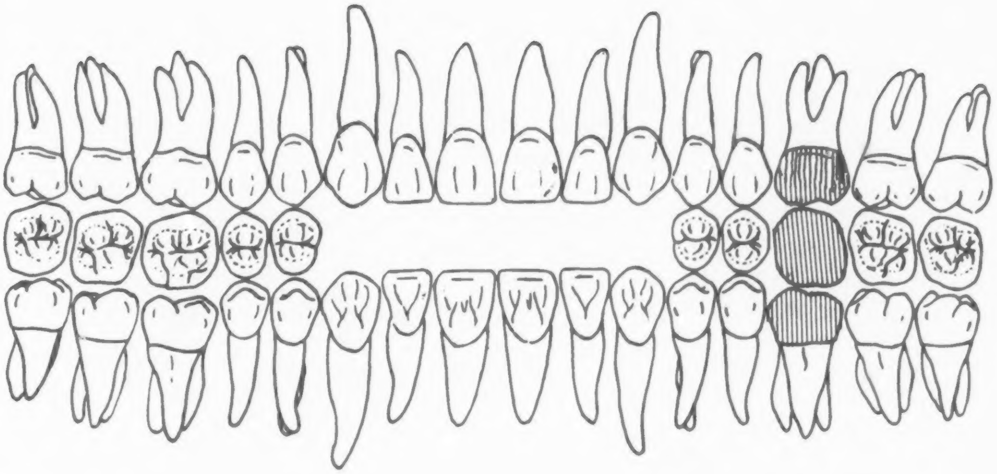
3. Practice adapting and placing a preformed plastic temporary crown. Complete the evaluation form after each trial. One hour is allotted for the first trial and forty minutes for the second trial.

PREPARING FOR MODULE 4

1. Examine the pre-prepared tooth #14.
2. View the videotape for Module 4.
3. Read the Module 4 Syllabus.
4. Familiarize yourself with the criteria and the Evaluation Form.
5. Answer the Study Questions, to check your background knowledge.

module 4

placing a custom plastic temporary crown



MODULE 4

PLACING A CUSTOM RESIN TEMPORARY CROWN

This particular crown can be fabricated for a posterior or anterior tooth. A custom resin crown can be made for a full coverage, 3/4 crown, inlay or onlay preparation without a great deal of involvement. It has a superior occlusal and gingival fit because it is molded from an impression of the patient's tooth. The crown's tooth-like appearance is an additional advantage. Construction of this crown may take longer to learn initially; once the contouring technique is mastered, it can be quick and easy.

In this module, the fabrication of a custom resin crown for tooth #14, the maxillary left first molar, is presented.

Overview of Procedure

The procedure begins and ends with checking occlusion. After checking occlusion, the operator will need to take an alginate impression before the tooth is prepared. Check the impression for air bubbles or voids in the area of the tooth that will be prepared for the crown.

After the tooth is prepared, the operator may want to remove proximal tags from the impression and reseat the impression to check for proper placement over the prepared tooth. An acrylic resin is then mixed and placed in the alginate over the impression of the tooth that has been prepared for a crown. The impression, which is filled with acrylic, is then placed over the prepared tooth. As the acrylic resin polymerizes over the prepared tooth, it will replicate the contour of the unprepared tooth. The temporary crown is then gently eased out of the impression and ready for trimming and contouring to fit the finish line of the prepared tooth. Once the contacts and occlusion are established, the crown is polished and cemented in place.

ARMAMENTARIUM

1. articulating paper and holder
2. prepared tooth #14
3. assorted quadrant impression trays
4. tray adhesive (for plastic trays)
5. utility wax
6. alginate
7. alginate scoop
8. alginate-mixing spatula
9. plastic mixing bowl
10. lab knife (or scalpel)
11. cement-mixing spatula
12. spatula (#7)
13. gauze sponges
14. acrylic resin kit
15. medicine dropper
16. 4 dappen dishes
17. small camel's-hair brush
18. small scissors (or curved crown and bridge scissors)
19. spoon excavator
20. magnifying glass
21. sharp soft pencil (#1)
22. acrylic bur
23. pumice impreginated rubber wheel
24. assorted discs/mandrel (Moore's)
25. petroleum jelly
26. dental mirror
27. explorer
28. dental floss
29 cotton rolls
30. temporary-cement kit
31. mixing pad
32. double-ended plastic instrument
33. lathe (optional)
34. rag wheel (optional)
35. fine polishing agents (optional)

PROCEDURE

Preliminary Procedure

To prepare for the fabrication of an acrylic resin temporary crown, first clean the left maxillary quadrant.

1. Check to be sure you have all the supplies listed in the Armamentarium.

2. Check occlusion with the unprepared tooth #14 by placing blue articulating paper between the left maxillary and the left mandibular arches, and gently tapping the teeth together in centric occlusion. There must be at least one occlusal mark on each tooth. (Note: This pattern must be replicated when the temporary crown is placed.)

3. Take an impression of the maxillary arch before the tooth is prepared for a crown.

4. Place the prepared tooth #14 in the dentiform; retain the unprepared tooth with its occlusal markings for future reference.

Crown Fabrication and Placement Procedures

1. TAKE AN ALGINATE IMPRESSION OF THE PREPARED TOOTH .

   Select proper tray size. A sectional tray works best since the temporary crown will be constructed for a single tooth and there is no need to use a full arch tray. There are two types of sectional trays. One type is a hard plastic or metal tray held in place by the operator while the alginate sets. The other type is a disposable plastic tray which is held in place by the patient occluding on it until the alginate sets.

   Mix the alginate according to manufacturer's instructions. Inspect the impression to be sure all details of the prepared tooth are accurately replicated and the impression is free of large voids and torn areas or potential undercut bulges. If the impression is acceptable, use a lab knife (or scalpel) to trim large overhangs of alginate that extend beyond the impression tray and thus might cause distortion. Remove interproximal tags from the alginate impression with a sharp instrument or cotton pliers. This allows the impression to be reinserted more easily and gives sufficient bulk to the temporary. Use the air and water spray to clean the impression. Wrap with a moist paper towel until ready for acrylic resin.

Criteria

a. Impression shows all details of the prepared tooth.

b. Impression is free of large voids, torn areas, and defects.

c. Impression is free of large overhangs of alginate.

d. Impression is free of interproximal tags of alginate.

e. Impression is clean and wrapped in moist paper towel.

2. PLACE TOOTH IN DENTIFORM

After placing the tooth in the dentiform, reseat the impression to check for proper placement over the prepared tooth.

3. FABRICATE THE ACRYLIC RESIN CROWN.

The technique for mixing the acrylic resin can be done directly in the alginate impression or it may be mixed in a dappen dish and applied to the impression mold of the area to be temporized. In order to add directly to the impression, begin by adding a small amount of polymer then a few drops of monomer (liquid) with an eye dropper directly in the impression mold of the unprepared tooth. (Let the drops fall on the walls of the preparation in order to prevent bubbles.) Then add sufficient polymer (powder) to absorb the liquid. Each ingredient is added repeatedly in turn until the tooth mold is approximately two-thirds full.

In order to use the dappen dish technique, partially fill the dappen dish with the monomer and then the polymer to absorb the liquid. The operator can add polymer gradually while tapping the dappen dish on the counter top to help saturate the monomer and eliminate air bubbles which could weaken the mix.

Regardless of which technique is used to mix the resin, the key elements are to apply the monomer and polymer repeatedly and to keep the eye dropper of monomer from touching the mix plus, taking further caution not to over fill the impression should help you form a solid crown which is full of bubbles.

The resin in the impression is ready to be placed over the prepared tooth when it has lost its highlights and surface shine. With even pressure, hold the impression in place or have the patient occlude; if using the disposable bite tray. The operator can hold excess acrylic resin between the fingers in order to monitor polymerization. The impression tray should be held very still until polymerization occurs (approximately 3-5 minutes). The acrylic resin will be slightly rubbery when it is ready to be removed.

Criteria

a. Acrylic resin is mixed to proper consistency.

b. Impression of tooth is two-thirds full of acrylic resin mix.

c. Impression is seated over prepared toothheadd very still for approximately 3 to 5 minutes.

d. Acrylic is at the slightly rubbery stage when removed.

4. REMOVE CROWN FROM IMPRESSION AND EXAMINE IT

Remove the crown from the impression. Use very gentle movement if the crown remains on the tooth when the impression is removed. The operator can ease the crown off of the preparation. Move very quickly at this point to trim excess bulk. Use curved crown and bridge scissors to trim away excess from the interproximal, buccal and lingual crown margins. All of the bulk excess should be trimmed quickly to prevent final set before placing the crown on the tooth. If final set occurs before placement, the crown may shrink or warp and will not fit properly.

Inspect the crown for voids. If any voids are present, fill them with acrylic resin, using the bead-brush technique. The crown should be clean and dry before each addition of resin. Dip the brush into monomer and then into polymer; paint the mixture into the void; clean the brush in a second dish of monomer; and wipe the brush on gauze. Repeat until the void is slightly overfilled.

Criterion

a. Crown replicates the unprepared tooth on its outer surface and the prepared tooth on its interior surface.

5. **REMOVE MARGINAL EXCESS FROM CROWN**.

Mark the preparation finish line with soft lead pencil. Trim the marginal excess to the finish line with an acrylic bur and/or assorted discs. If the gingival 1/3 of the crown has excess bulk where the interproximal tags of the impression were trimmed, remove excess with the acrylic bur, and clean the crown of debris with an air spray.

Criteria

a. Crown is trimmed to the impressed margin.

b. Crown is free of debris.

6. **CHECK CONTACTS, MARGINAL ADAPTATION, AND CONTOURS OF THE CROWN**

Place the crown on the prepared tooth, and assess its fit. If the crown does not seat completely, one or both contacts may be too bulky. Acrylic resin may be removed with the acrylic bur. Reseat the crown and check the contacts with dental floss. Should the contact areas (in the middle third) be under contoured, add acrylic resin to the crown with the bead-brush technique. The crown must be clean and dry for the resin to adhere, and it should be seated when the resin is at the rubbery stage in order to establish the contacts. Trim the acrylic resin additions with the acrylic bur, and clean away the debris with an air spray.

Once the crown is fully seated, make sure the margin meets the finish line and conforms to it. If the crown has an open margin or needs more retention, at this point you can reline the interior of the crown with resin. Relining is accomplished by mixing the resin in a dappen dish or adding monomer to the interior of the crown and slowly adding the polymer. It is important that the operator seats the crown properly and applies pressure as the acrylic polymerizes. In the clinical setting, the operator would want the patient to occlude on a cotton roll or use an index finger to assure even pressure. Acrylic additions should be smoothed with an acrylic bur or discs. A mouth mirror is used to compare the buccal and lingual contour of the crown with that of the adjacent teeth. Contour the crown as necessary.

Criteria

a. Mesial and distal contacts re-established.

b. Crown margin is adapted to the finish line.

c. Buccal and lingual contour of crown conforms to that of the adjacent teeth.

d. Crown is free of debris.

7. CHECK OCCLUSION.

The thickness and contour of the occlusal surface of the crown depend on the pressure that was exerted during polymerization. Check occlusion after seating the crown on the prepared tooth. Compare the markings on the crown with those of the unprepared tooth. Remove any prematurities with the acrylic bur.

If the crown is in infra-occlusion, add acrylic resin, using the bead-brush technique. After applying the acrylic resin, wait a moment for the acrylic resin to develop a doughy texture; then seat the crown and close the teeth into occlusion to contour the occlusal surface of the crown.

Criterion

a. Crown's occlusion replicated that of the unprepared tooth.

8. SMOOTH AND POLISH THE CROWN.

Remove the crown. With a straight handpiece and a pumice-impregnated rubber wheel smooth all its surfaces. Use light, intermittent strokes to keep from deforming the contours and contacts. For a highly polished surface, you may use a polishing agent with the rag wheel on a lathe.

Criterion

a. Crown is smooth and shiny.

9. CHECK CROWN BEFORE CEMENTATION.

Reseat the crown. Check its marginal adaptation, contacts, contours, and occlusion, as before.

Criteria

a. Crown margin meets, contours to, and fits snugly against preparation finish line.

b. Crown contacts adjacent teeth.

c. Crown's contours duplicate those of unprepared tooth #14.

d. Crown's occlusion replicates the occlusion of unprepared tooth #14.

10. CEMENT THE CROWN.

Remove the crown; rinse and dry the preparation area. Isolate the area with rolls of cotton. Apply a thin layer of petroleum jelly to the exterior of the crown, to facilitate the removal of excess cement. The lubricant should not contact the interior of the crown; it will prevent adherence.

Mix temporary cement according to the manufacturer's directions. When it has a uniform consistency and flows freely, use a plastic instrument to coat the internal surfaces of the crown with a thin layer of the cement.

Seat the crown on the preparation. Place a cotton roll on the occlusal surface of the crown, and occlude the teeth. Check with the explorer at the crown's margin to see that the crown is fully seated. Hold the teeth in occlusion until the explorer can no longer penetrate the extruded cement.

When the cement is set, remove the cotton rolls, and use the explorer to chip away any excess cement. Use dental floss to free the interproximal areas of cement. A knot can be tied in the floss to aid in interproximal removal of cement. Rinse and air dry the restoration.

Criteria

a. Preparation is clean, dry and isolated.

b. The exterior of the crown is lubricated.

c. The interior of the crown is coated with a thin layer of temporary cement.

d. Crown's margin fits snugly at preparation finish line when crown is seated.

e. No excess cement is present.

f. Restoration is clean and dry.

11. CHECK CROWN AFTER CEMENTATION.

Using the mirror and the explorer, check the crown margin for fit and seat. At least 95% of the margin must meet the finish line. Compare the contours of the crown with those of the adjacent teeth.

Check contacts, and make a final occlusal check. Should the crown need re-contouring, use a green stone, and then a fine disc.

Criteria

a. At least 95% of crown margin meets preparation finish line, and entire margin is sealed with cement.

b. Crown contours are aligned with those of adjacent teeth.

c. Crown contacts adjacent teeth mesially and distally.

d. Crown's occlusion matches occlusion of unprepared tooth.

SUMMARY OF PROCEDURES AND CRITERIA

Procedures	Criteria
1. Take an alginate impression the prepared tooth, and trim it.	a. Impression shows all of details of the prepared tooth.
	b. Impression is free of large voids, tin areas, and defects.
	c. Impression is free of interproximal tags and large overhangs of alginate.
	d. Impression is clean and free of excess water.
2. Test seating the alginate impression on dentiform.	a. The impression of the prepared tooth seats fully into the dentiform of the unprepared tooth.
3. Fabricate the acrylic resin crown.	a. Impression of tooth #14 is two-thirds full of acrylic resin mix.
	b. Impression is fully seated on the dentiform with even pressure.
	c. Impression is held very still (approximately 3-5 minutes) until slightly rubbery.
4. Remove crown from impression and examine it.	a. Crown replicates the unprepared tooth on its outer surfaces and the prepared tooth on its interior.
5. Remove marginal excess from crown.	a. Crown is trimmed to the impressed margin.
	b. Crown is free of debris.
6. Check contacts, marginal adaptation, and contours of the crown.	a. Mesial and distal contacts re-established.
	b. Crown margin is adapted to the finish line.
	c. Buccal and lingual contour of crown conforms to that of the adjacent teeth.
	d. Crown is free of debris.

7.	Check occlusion.	a.	Crown's occlusion replicates that of the unprepared tooth.
8.	Smooth and polish the crown.	a.	Crown is smooth and shiny.
9.	Check crown before cementation.		Crown margin meets, contours to, and fits snugly against preparation finish line.
		b.	Crown contacts adjacent teeth.
		c.	Crown contours replicate those of unprepared tooth #14.
		d.	Crown occlusion replicates that of unprepared tooth #14.
10.	Cement the crown.	a.	Preparation is clean, dry and isolated.
		b.	The exterior of the crown is lubricated.
		c.	The interior of the crown is coated with a thin layer of temporary cement.
		d.	Crown margin fits snugly at preparation finish line when crown is seated.
		e.	No excess cement is present.
		f.	Restoration is clean and dry.
11.	Check crown after cementation.	a.	At least 95% of crown margin meets preparation finish line, and entire margin is sealed with cement.
		b.	Crown contours are aligned with those adjacent teeth.
		c.	Crown contacts adjacent teeth mesially and distally.
		d.	Crown occlusion matches the occlusion of the unprepared tooth.

EVALUATION FORM
CUSTOM PLASTIC TEMPORARY CROWNS

Name:____________________________

Date:__________

Grade:__________

2 = Acceptable
1 = Improvable
0 = Unacceptable

	Instructor Trial 1	Self Trial 1	Instructor Trial 2	Self Trial 2
1. Crown contacts adjacent tooth:				
Mesially	_____	_____	_____	_____
Distally	_____	_____	_____	_____
2. Crown margins meet preparations with 0.5 mm of the finish line				
Buccal/Lingual	_____	_____	_____	_____
Interproximal: Mesial/Distal	_____	_____	_____	_____
3. Marginal ridge height of crown is acceptable with adjacent teeth				
Mesial	_____	_____	_____	_____
Distal	_____	_____	_____	_____
4. Crown contour resembles that of the original tooth				
Facial	_____	_____	_____	_____
Lingual	_____	_____	_____	_____
Incisal/occlusal	_____	_____	_____	_____
5. Crown is smooth and polished	_____	_____	_____	_____

Crown fitted within reasonable time limit.

	Instructor Trial 1	Self Trial 1	Instructor Trial 2	Self Trial 2
Trial 1, 2 Hours (3 errors or less is acceptable)	_____	_____		
Trial 2, 1 Hour (4 errors or more is unacceptable)			_____	_____

Comments:____

PRACTICE

Study the models of the cemented and uncemented crowns with a magnifying glass, and note the differences in the thickness of the acrylic resin, in contour, and in fit. Using the explorer at the junction of the margin and finish line, feel the marginal integrity. Repeat with the models placed on the dentiform. Notice particularly the fit of the uncemented crown to the prepared tooth.

Model Study

List of Models for Study

a) Temporary custom plastic crown trimmed and contoured, all criteria met; with prepared tooth.

b) Temporary custom plastic crown with uneven occlusal surface from distortion during polymerization.

Study the prepared tooth. Examine the finish line with an explorer and magnifying glass. Inspect the models of defective crowns, and determine what errors in technique could have caused the defects. How could those techniques have been improved?

Crown Fabrication and Evaluation

1. Review the videotape.

2. After making the preliminary occlusal check, remove tooth #14 without disturbing the blue marks. Save the tooth for comparison when you check the occlusion of the fabricated crown.

3. No evaluation form is provided for making the impression. If you are concerned about the adequacy or either, consult your instructor.

4. Practice fabricating the custom crown, evaluate using the form provided. Two hours is allotted for the first trial and one hour for the second trial.

PREPARING FOR MODULE 5

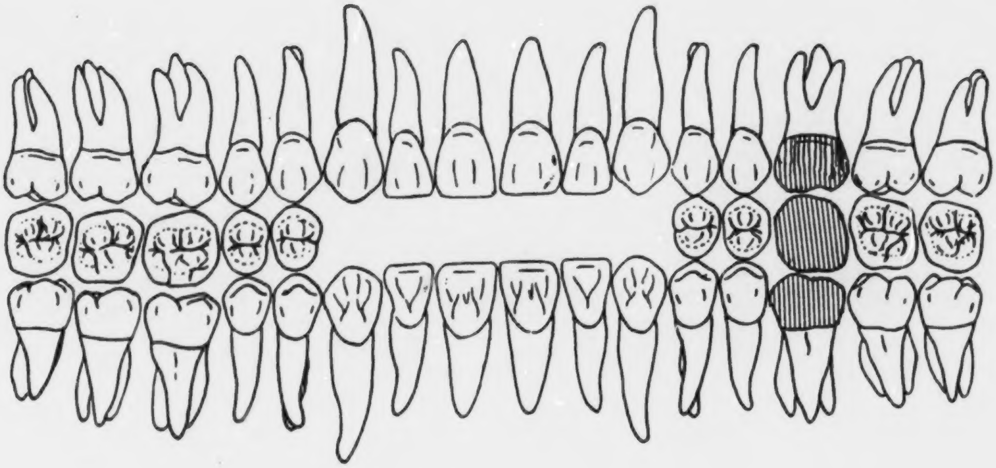
1. Review the videotape from Module 4.
2. Read the Module 5 syllabus.
3. Familiarize yourself with the updated techniques.
4. Answer the study questions.

STUDY QUESTIONS

1. What advantages and disadvantages do custom plastic temporary crowns present?
2. How can you hasten polymerization.
3. What possible errors could distort the contours of a custom plastic temporary crown during polymerization?
4. Why must the original occlusal pattern be replicated when the temporary crown is placed?

MODULE 5

ADDITIONAL TECHNIQUES EMPLOYED
FOR FABRICATION OF
CUSTOM TEMPORARY CROWNS



MODULE 5

ADDITIONAL TECHNIQUES EMPLOYED FOR FABRICATION OF CUSTOM TEMPORARY CROWNS

The previous modules have listed the basic objectives and described the technique for fabrication of a custom acrylic temporary crown. There are a few other techniques that are employed in some dental practices. This segment of the temporary crown module is intended to familiarize the student with these alternative techniques; however, actual practice is recommended prior to attempting them in the clinical setting.

Additional techniques for fabrication of custom temporary crowns which will be discussed include the following:

1. Wax molding technique
2. Silicone putty impression
3. Intraoral molding technique
4. Vacuum-formed plastic resin tray
5. Relining of the aluminum temporary crown.

Wax Moulding Technique

Instead of taking an alginate impression, the operator may use pink baseplate wax for taking the impression.

1. Cut a piece of 3"x 5" plate wax to approximately 3"x 2 1/2" and fold it in half lengthwise. Place the wax in a bowl of hot water to soften or place over hot water facet or a flame.

2. Place the wax over the prepared tooth and finger burnish it onto the occlusal surface and into interproximal areas. Wax is hardened by cooling with air from air/water syringe. Once the wax matrix hardens, remove it from the prepared tooth and trim excess wax.

3. Use the wax moulded impression in the same manner as an alginate impression. The operator may want to cool the acrylic resin while it is polymerizing with the air from the air/water syringe.

Some operators prefer the wax moulding technique because it is less expensive than alginate impressions and trays and it saves time.

Silicone Putty Impression

Another impression material used for custom temporary crowns is silicone putty. Silicone putty is placed in a sectional tray like the alginate impression material.

1. The silicone putty is mixed with two equal parts of compound.
2. The operator kneads the putty with his/her fingers to produce a homogenous, streak-free mix. The material is kneaded for about one minute.
3. The silicone putty is then placed in the tray and applied over the unprepared tooth until it is set.
4. The operator has now prepared a custom tray which can be used for fabrication of the temporary crown. Some silicone materials are very stable and can be kept for extended periods of time.

Some operators prefer silicone putty impressions because of their versatility for use in a broad range of techniques. Most manufacturers supply additional curing silicones in various viscosities: heavy body, regular, light body wash. The advantage with the silicone putty is that the final impression is taken with the putty impression being your custom tray.

Intraoral Moulding Technique

An alginate impression of the tooth is not necessary when the intraoral moulding technique, or "blob" technique is employed. The acrylic resin itself is used to fabricate the temporary crown without any preliminary impression prior to tooth preparation.

1. Mix the acrylic resin in a dappen dish as described previously.
2. When the acrylic has lost its highlights and has a doughy consistency (like putty), the operator moulds the resin into a rectangular "blob."
3. The acrylic is moulded over the prepared tooth and the patient occludes in order to establish the impression.
4. Gross excess will be present on the buccal, lingual and interproximal surfaces. The excess is trimmed in the mouth with a sharp instrument, or the temporary is removed from the mouth and crown and bridge scissors are

used for trimming. It is important to proceed quickly at this point to prevent shrinkage. The final polymerization should be done in the mouth. The patient's tongue can help mould the resin on the lingual surface.

5. Proceed with trimming and contouring according to dental anatomy of the particular tooth being restored. Check occlusion.

6. Sometimes it is necessary to re-line the first attempt or to add to contact areas or the occlusal surface. This re-lining is easily accomplished as described in Module 3 and 4.

The advantage of this technique is that it does not require any initial work before the tooth is prepared. It is preferred by some operators when patients have broken teeth and a preliminary impression of the unprepared tooth is needed. The intraoral moulding technique works well for anterior or posterior teeth alike. It also has excellent margin adaptation. This technique is particularly suitable for inlays, onlays, and 3/4 crowns.

Vacuum-formed Plastic Resin Tray

A vacuum-formed plastic resin tray is a plastic matrix heated to the shape of the arch using a vacuum forming system. It can be a full arch matrix or a sectional matrix. It is used when the dentist is making multiple crowns or several unit bridges. In this case, it is very helpful to have a clear plastic resin sheet vacuum-formed to the study model.

This type of tray enables the operator to have a custom tray made to fit the patient's mouth without the distortion that can occur with an alginate impression. This custom form can be re-used a number of times if needed, unlike the alginate impression. The disadvantage of the plastic resin tray technique is that it may require two appointments: one for the impressions and study models which are needed for vacuum-forming the tray prior to the crown preparation appointment. The advantage is the clear tray allows the operator to see if it is seated properly.

Relining Aluminum Shell Crowns

At times, aluminum shell crowns may not have adequate retention or marginal adaptation. It is possible to reline the shell with acrylic resin. This technique would result in an aluminum temporary crown which fits better and lasts longer.

To review the steps in relining a temporary crown with acrylic resin, the following summary is provided:

1. Coat prepared tooth with petroleum jelly.
2. Mix acrylic in a dappen dish or directly in the aluminum shell.
3. Place acrylic in the aluminum shell (2/3 full) and allow time for surface to dull.
4. Place lined shell on prepared tooth and apply even pressure, or have the patient occlude, until acrylic has polymerized.
5. Trim excess acrylic in the mouth with a sharp instrument.
6. Smooth, polish, and clean crown before cementing.

STUDY QUESTIONS

1. What are the different technqiues for fabrication of a custom temporary crown?

2. Which of the techniques is considered the most versitle and affordable?

3. What are the advantages of each of these techniques?

4. Why is it necessary for the operator to reline the aluminum shell if it already fits snuggly to the finish line?

SUMMARY

This module has provided instruction in fabrication and placement of temporary crowns. Specific procedures have been described for the following types of temporary crowns: aluminum, polycarbonate, and custom. Additional techniques were discussed in an attempt to familiarize the student with a few of the vast array of techniques employed in dentistry. It should be understood that a clinical setting will present an indefinite variety of cases that may require alternate steps.

The information in this written instructional module is intended for use in conjunction with a classroom/laboratory course. The course should provide practice and competency evaluation for the student learner. Once the student has had the experience of working with different types of crowns and techniques, he/she can evaluate which technique is most suitable for the particular case and for a given office setting.

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REFERENCES

Baum, Lloyd, McCoy, Richard B. Advanced Restorative Dentistry. Philadelphia: W.B. Saunders Co., 1984.

Castano, Frances, A., Alden, Betsy. Handbook of Expanded Dental Auxiliary Practice. J. B. Lippincott Co., 1973.

Chasteen, Joseph E. Essentials of Clinical Dental Assisting. The C.V. Mosby Co., 1989.

Phillips, William J. Elements of Dental Materials. Philadelphia: W. B. Saunders Co., 1984.

Simon, William J. Clinical Dental Assisting. Harper and Row, Inc., 1973.

Spohn, Eric E., Halowski, Wendy A., and Berry, Thomas G. Operative Dentistry Procedures for Dental Auxiliaries. The C. V. Mosby Co., 1981.

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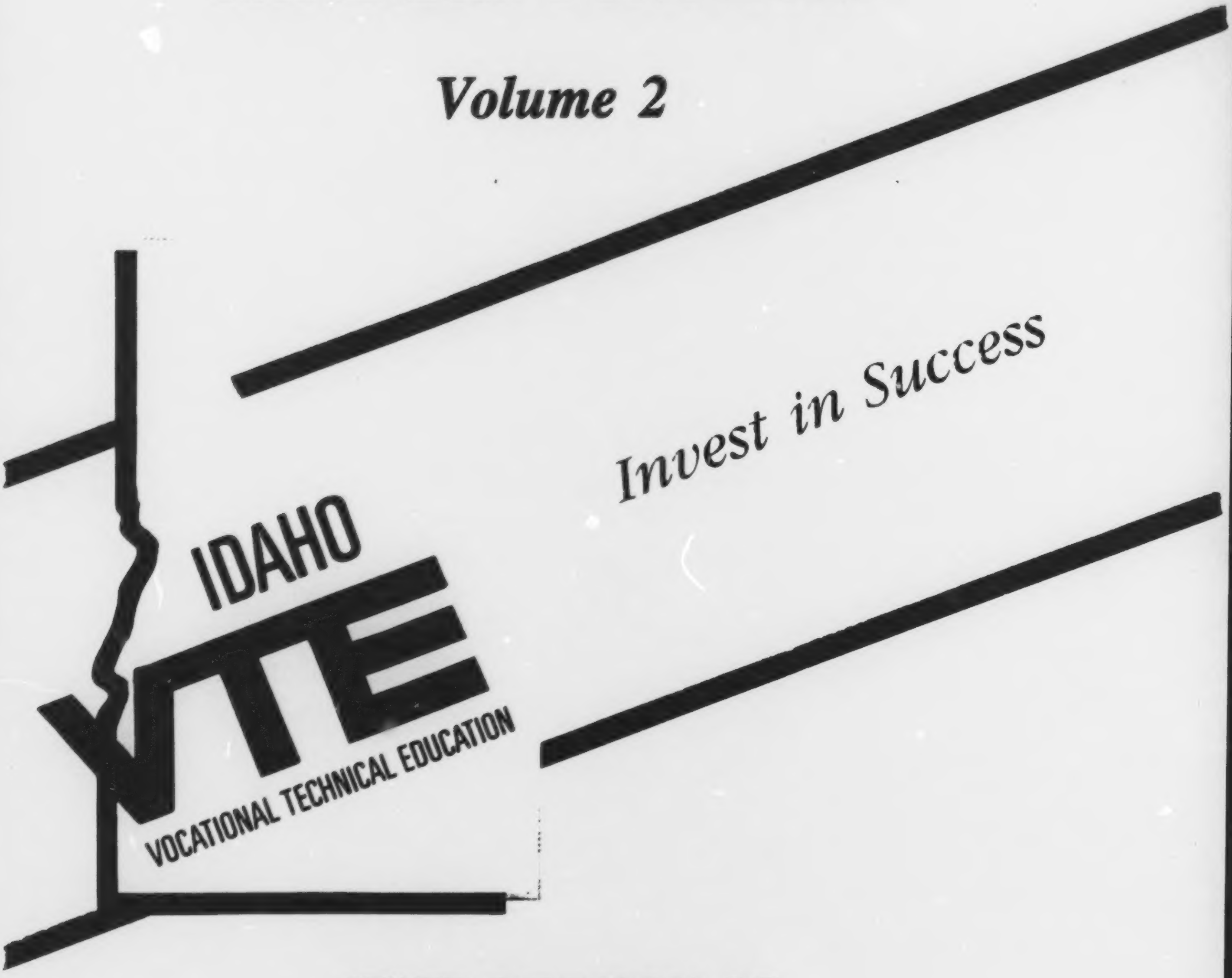
Volume 2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1992

Module 4

POLISHING AMALGAM

Module 4-A

POLISHING AMALGAM

Instructor/Student Module

POLISHING AMALGAM RESTORATIONS
A Self-Study Module

developed by
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June, 1991

Adopted by
Idaho State Board for Vocational Education
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Boise, Idaho

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INTRODUCTION

In order for Idaho dental assistants to legally polish amalgam restorations under the direct supervision of a dentist, they must first successfully complete coursework approved by the Idaho State Board of Dentistry. A certificate or diploma of course completion as issued by the teaching institution will be the assistant's verification of compliance with Board standards. This module was designed to be utilized by Board-approved teaching entities. It offers basic information which is intended to be supplemented with formal classroom, laboratory and clinical instruction.

There are a variety of techniques for polishing amalgam restorations. To minimize confusion, this module describes only one technique. This technique provides the basic knowledge necessary to learn the skill of polishing amalgam restorations. The polishing of a Class II amalgam restoration is described so that the student will have an opportunity to learn the technique for polishing both the occlusal and interproximal surfaces. By so doing, both concave and convex surfaces will be polished, and the skills gained from polishing a Class II can be easily transferred to other classifications of amalgam restorations (e.g., Class I, Class V).

It should be pointed out that the polishing technique described herein does not include the technique for removing amalgam overhangs. Overhang removal (i.e., margination) is a procedure which requires training in itself. This polishing technique includes only those margination procedures which can be accomplished using the armamentarium listed in the module. As such, only minute amounts of excess amalgam from any margin of the restoration will be removed. Any restoration with substantial excess amalgam at the proximal margins, particularly the gingival proximal margin, will require the attention of a person skilled in overhang removal/margination procedures prior to completion of the amalgam polish procedure.

To acquire the knowledge and skills necessary to polish amalgam restorations, the following instructional pattern is suggested:

1. Read the module in its entirety and answer the study questions which are included at the end. Familiarize yourself with the armamentarium that will be needed. Also review the practice activities and evaluation mechanisms that are included in your course outline.

2. Review the videotape of the procedure during a class session.

3. Perform all activities listed in the course outline. Complete self-evaluations as well as instructor evaluations as you progress.

At the end of the practice sessions, a short written test will be administered. Your instructor will provide further information about the final practical certifying exam during your course.

COURSE OUTLINE
POLISHING AMALGAM RESTORATIONS

Clock Hours

Lecture/Demonstration:	3 hours
Laboratory:	8-1/2 hours
Written Examination:	30 minutes
Final Practical Examination:	For the convenience of both students and examiners, it is suggested that the final exam for this course be offered concurrently with the final exam for temporary crowns and alginate impressions.

Course Description

The primary goal of this course is to provide practicing dental assistants with background knowledge and laboratory/clinical experience in the application of principles and procedures used in polishing amalgam restoration. Upon successful completion of this course, the student will receive a certificate of completion/recognition indicating competency in performing this procedure.

Required Text

Polishing Amalgam Restorations, a self-study module developed by Carlene Paarmann, RDH, MEd, Idaho State University, 1991.

Course Requirements

1. Attend all class, laboratory, and clinical sessions.
2. Requirements on dentoforms: complete 3 acceptable Class II amalgam polishings on Columbia Dentoform Teeth #5, #14, #19.
3. Requirements on patients: complete 1 acceptable Class II amalgam polishing. †see *Amalgam Polishing Evaluation Form.* If a critical task (marked on evaluation form with *) is not completed, the evaluation is automatically unsatisfactory and must be redone. A **minimum score of 80%** must be achieved on each polish. This may require polishing several amalgam restorations to meet an acceptable level.)

Patients who are invited to participate in this class must verify permission from their family dentist. A permission slip (see page 8) must be signed by their dentist, indicating that the treatment was diagnosed and permission is granted to perform the service(s) listed on the form. Permission slips are given to the course instructor prior to performing the procedures.

NOTE: Amalgams may be polished on other students to complete requirements.

4. Achieve a minimum of 75% on the written examination.
5. Successfully complete the final practical examination to receive a certificate of completion/recognition to perform this function (Columbia Dentoform Tooth #30-MO).
6. Materials to be supplied by the student (see page 25):
    a. Class II amalgam restorations to complete lab requirements (Columbia Teeth No's. 5, 14, 19)
    b. slow speed handpiece and contra-angle
    c. disks/mandrels
    d. green stones
    e. finishing burs
    f. garmer clamps, rubber dam armamentarium or other isolation materials
    g. evacuator tips
    h. finishing strips
    i. dental floss/tape
    j. polishing cups
    k. polishing agents
    l. basic setup
    m. other expendable supplies as designated by the instructor

Evaluation/Grading

This course is designed on a Pass/Fail basis. In order for the student to pass the course, the requirements listed above must be successfully completed. As previously stated, the minimum percentage for acceptable amalgam polishings is 80%. All critical tasks listed on the evaluation form (identified by *) must be completed. If a critical task is not completed (in other words, a "2" is not achieved), the process evaluation is unsatisfactory and must be redone, regardless of the score. A minimum score of 75% must be achieved on the written examination. A description for determining the percentage scores is presented below.

A. Calculating Percentages for Amalgam Polishings

Refer to the attached evaluation form (it is the same as the evaluation form on page 40 of the corresponding module). Each criteria is evaluated as follows:

C = Criterion met = 2 points
I = Criterion improvable = 1 point
X = Unacceptable = 0 points

Since there are 10 criteria, each worth a maximum of 2 points, there are 20 total points possible for each amalgam polish. A percentage score can then be calculated by adding the total number of points earned and dividing by the total points possible (20). To facilitate calculations, the following evaluation scale is provided:

Points Achieved	Percentage	
20	100	
19	95	
18	90	
17	85	
16	80	Proficiency Level
15	75	
14	70	
13	65	
12	60	
11	55	

B. Calculating Percentages for Written Examination

For each wrong answer on the written examination subtract 5 points from 100 to determine final score.

Procedure

1. Read the self-study module, Polishing Amalgam Restorations.
2. Answer study questions on page 36 of module.
3. Answer objectives listed at the beginning of the module.
4. For supplementary reading, refer to references listed on page 39 of the module.

COURSE SCHEDULE

Clock Hours	Method of Instruction	Assigned Topic/Activity	Readings
3	Lecture/ Demonstration	Introduction to Course Purpose of polishing restorations Properties of amalgam Selection of restorations to be polished Principles of polishing Precautions Armamentarium Amalgam Polishing Procedure	Self-study module, pp. 1-40
	Videotape	View videotape "Polishing Amalgam Restorations"	
4	Laboratory	Students practice polishing amalgam restorations on dentoforms to complete course requirements* (3 acceptable Class II amalgam polishings) *Refer to Course Requirements	
4-1/2	Clinical	Students practice polishing amalgam restorations on patients to complete course requirements* (1 acceptable Class II amalgam polishing) *Refer to Course Requirements	
30 Minutes	Written Examination	A comprehensive written exam consisting of multiple choice and/or true/false questions.	

AMALGAM POLISHING
EVALUATION FORM

Clinician____________________ Patient____________________

Date____________________ Instructor____________________

Tooth # & surface____________________ Score____________________

Key: C = Criterion Met = 2
I = Criterion Improvable = 1
X = Unacceptable = 0
* = Critical task; if a 2 is not achieved on a critical task, the process evaluation is unsatisfactory and must be redone.

		SELF			*INSTRUCTOR*		
TASK		**C**	**I**	**X**	**C**	**I**	**X**
1.	Margins are flush along the cavosurface margins:						
	a. occlusal	2	1	0	2	1	0
	b. proximal	2	1	0	2	1	0
2.	Contour of the restoration is correct:						
	a. marginal ridge	2	1	0	2	1	0
	b. embrasures	2	1	0	2	1	0
	c. contact area maintained*	2	1	0	2	1	0
	d. groove definition	2	1	0	2	1	0
3.	Amalgam is smooth on entire surface (no voids, scratches, or graininess):						
	a. occlusal	2	1	0	2	1	0
	b. proximal	2	1	0	2	1	0
4.	Amalgam surface is lustrous.	2	1	0	2	1	0
5.	No damage to the restoration, adjacent teeth, or tissue.	2	1	0	2	1	0

________/20

________%

NOTE: Restorations must pass criteria for acceptability before polishing.

AMALGAM POLISHING
PERMISSION SLIP

This is to verify that I examined ______________________________
(patient name)

on ____________________ and diagnosed the treatment approved below. I give my
(date)

permission for this patient to receive amalgam polishings as part of the Statewide Expanded Functions for Dental Assistants certification program.

☐ Amalgam Polishings (check here if teeth were examined and treatment is approved)

Please list tooth/teeth approved for amalgam polishings:

________ ________
________ ________
________ ________
________ ________
________ ________

Dentist Signature______________________________

Date______________________________

OBJECTIVES

1. List and explain the major reasons for polishing amalgam restorations.

2. Explain the function of each component of the amalgam polishing armamentarium.

3. Explain and use aseptic technique as it applies to this procedure.

4. Explain what to look for when evaluating the accuracy of dental anatomy in a given restoration.

5. Distinguish between a serviceable restoration and one which should be replaced.

6. Recognize and use effective instrument grasp and stable fulcrum.

7. List and demonstrate the sequence of steps for polishing amalgam restorations.

8. Explain the precautions which must be taken during the polishing procedure and describe how they will be accomplished.

9. Explain the criteria for an adequately polished amalgam restoration.

10. Evaluate polished amalgam restorations to determine if they meet criteria for acceptability and determine ways to improve or modify, if necessary.

BACKGROUND INFORMATION

Placement of amalgam restorations is just one aspect of achieving and maintaining optimal dental health. When teeth are restored with amalgam restorations, those restorations must not detract from the health of the teeth and the surrounding tissues. A properly contoured, polished restoration will contribute to the longevity of the restoration and the health of the surrounding periodontium.

Whether or not it is necessary to finish and polish an amalgam restoration remains to some a controversial subject. Some dentists will argue that a correctly carved amalgam does not require any more manipulation. Despite this argument, there remain some very valid reasons to carefully finish the margins, smooth the surfaces, and polish the restoration. An amalgam restoration that will contribute to the long-term dental health of a patient requires proper finishing and polishing procedures.

Finishing amalgam restorations involves removing marginal irregularities, defining anatomical contours, and smoothing the surface roughness of the restoration. Polishing is performed to obtain a smooth, shiny luster on the surface of the amalgam. In some cases, restorations may also need to be recontoured. This involves changing the form or shape of the restoration, which is necessary if the restoration does not reproduce the original contours of the tooth. Uncorrected marginal excess or improper contouring can make oral hygiene difficult or impossible since adjacent areas may become inaccessible to a toothbrush or dental floss, thus leading to an accumulation of dental plaque.

PURPOSES OF POLISHING RESTORATIONS

The next few paragraphs of this module explain several important reasons why amalgam restorations should be polished: prevention of recurrent decay, prevention of deterioration of the amalgam surface, maintenance of periodontal health, and prevention of occlusal problems. The information presented in this section is taken from *Operative Dentistry Procedures for Dental Auxiliaries* (Spohn, E., Halowski, W., and Berry, T., The C.V. Mosby Company, 1981).

Both previously placed "old" and newly placed amalgam restorations will be improved by finishing and polishing. Because old restorations have undergone some degree of tarnish and corrosion, they take a little longer to finish and may not exhibit the same smooth, shiny surface as can be achieved by polishing new restorations. An additional benefit of polishing amalgams is that of increased patient motivation. Because the amalgam is more esthetically pleasing, it may be perceived as more valuable and contribute to the patient's desire and motivation to clean and take care of the restoration.

Prevention of recurrent decay. After carving is completed, the surface of the amalgam is still somewhat rough and the margins are not as smooth as they can be. As a result, the potential of increased plaque accumulation and retention of debris exists, both on the surface of the restoration and along the margins. These conditions increase the likelihood of recurrent decay around the restoration. Finishing and polishing amalgam restorations result in a smooth, lustrous finish of surfaces and margins. Plaque and debris collection are reduced, and the restoration is easier to clean.

Prevention of amalgam deterioration. One of the shortcomings of amalgam as a restorative material is its tendency to tarnish and corrode. Tarnish is a discoloration on the surface of the amalgam, primarily a film of sulfides which usually results from certain foods or oral debris. As the tarnish layer becomes thicker and darker with the aging of the amalgam, it becomes readily visible. By itself it is not particularly damaging to the amalgam, but it is unsightly. It can occur on a polished amalgam, but generally at a much slower rate than on an unpolished restoration. Corrosion, on the other hand, is a destructive attack on both the surface and subsurface of the restoration, and is one of the causes of surface pitting and/or the breakdown of the margins of the restoration. Marginal breakdown may, in turn, lead to recurrent caries or fracture of the restoration. Corrosion is an actual chemical deterioration of the amalgam resulting from the reaction of the metal with such things as air, moisture, acid or alkaline solutions and other chemicals. A smooth, polished surface is less likely to accumulate acids, plaque, and debris, which may encourage galvanic action on the surface, and thus is less likely to develop a tarnished appearance.

Maintenance of periodontal health. Any restoration must not only maintain a healthy environment for the soft tissues but must also ensure the patient's ability to cleanse the area. The facial, lingual, and proximal surfaces are critical areas that may affect the patient's oral hygiene and the periodontium. Proximal contact areas are surrounded by "spaces", known as embrasures, on all four sides of the contact areas: occlusal, gingival, buccal, and lingual, and they are named according to their location. The gingival embrasure may not be as easily visible as the other embrasures because it houses the interdental papilla which usually fills the entire space. Embrasures are vital to the maintenance of a healthy periodontium. They serve as spillways or escapeways for the passage of food from the occlusal surfaces and provide stimulation to the surrounding soft tissues. Proximal contours of the teeth and embrasure spaces are intimately related since the shape of the embrasure spaces is dependent upon the shape of the proximal surfaces. Figures 1 and 2 below demonstrate normal proximal contours and embrasure spaces.

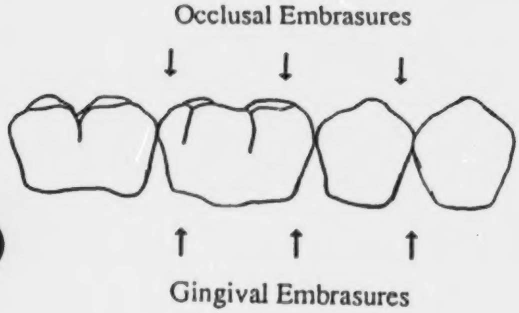

Figure 1. Proper anatomic contour. Arrows are pointing to the occlusal and gingival embrasure spaces.

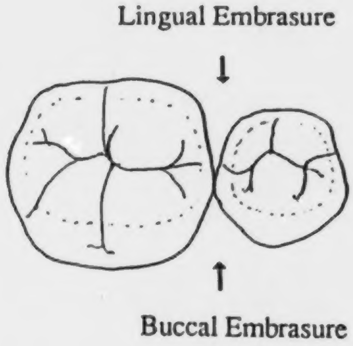

Figure 2. Proper anatomic contour. Arrows are pointing to the buccal and lingual embrasure spaces.

Restorations that are improperly contoured contribute to periodontal breakdown. An overcontoured surface presents an area that quickly collects and harbors plaque, resulting in irritation. This bulky contour may interfere with the patient's ability to cleanse the area. A slightly undercontoured restoration is less of a potential problem because it is less likely to interfere with the patient's ability to clean the area. The restoration overcontoured in the gingival embrasure leaves less space for the papilla. This encroachment on the space may lead to strangulation or physical displacement of the papilla. Either situation increases the likelihood of tissue breakdown. An undercontoured proximal area may have a poor contact, which increases the potential for food impaction. Food impaction is not only frustrating for the patient but irritating to the soft tissues. A properly contoured proximal surface is easily cleansed with dental floss. A contact area that is too tight presents the potential for mechanical irritation from floss being forced through the contact. A rough contact area may tear the floss. The frustration of the patient may contribute to inadequate flossing. Figures 3 and 4 demonstrate improperly contoured proximal surfaces and embrasure spaces.

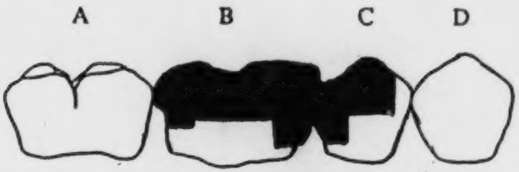

Figure 3. PROXIMAL CONTOURS

A & D:	proper anatomic contour
B (distal):	inadequate amalgam on distal (undercontoured)
B (mesial):	excess amalgam on gingival embrasure and occlusal embrasure (overcontoured)
C:	excess amalgam on distal (overcontoured)

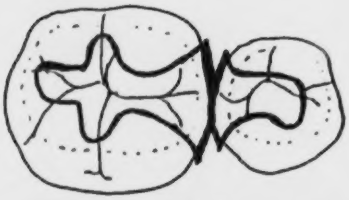

Figure 4. BULKY EMBRASURES (buccal and lingual)

The gingival floor of the proximal box is frequently subgingival, and restorations with extreme excess in these areas can lead to severe periodontal trauma. As mentioned in the introduction to this module, excess amalgam at the gingival margin of the restoration (overhang) that is too bulky to remove with armamentarium other than that listed for the polishing procedure described herein, will require the attention of a person skilled in overhang removal/margination procedures prior to completion of the amalgam polish procedure.

Recontouring, finishing, and polishing provide an opportunity to correct discrepancies in the anatomical contours of the restoration. With the use of specific instruments, the contours of the amalgam can be altered, and the health of the adjacent tissues can be preserved if recontouring and finishing procedures are accomplished within a reasonable timeframe.

Prevention of occlusal problems. Potential occlusal problems may be prevented by the finishing of amalgam restorations. Occasionally, a restoration may be left in premature occlusion, which can lead to several problems. The tooth may exhibit pain or sensitivity, especially during mastication. In more severe cases, the restoration or the opposing tooth may fracture. The tooth may undergo slight orthodontic movement because of the pressures of premature occlusion. This problem can be corrected during the recontouring process.

All of the above-listed reasons for performing finishing and polishing procedures lead to an increased serviceable lifetime of the restoration. The benefits gained from finishing and polishing amalgam restorations should be explained to your patients as part of your routine patient education program. The amount of discussion will, of course, vary with the individual patient, but generally your explanation should include: 1) reasons for polishing amalgam restorations; 2) the general sequence of procedures used to accomplish the task; and 3) sensations that the patient may experience during the polishing procedure.

PROPERTIES OF AMALGAM

Because mercury is one of the components incorporated into amalgam restorations, the use of amalgam is currently somewhat of a controversial issue and is being closely scrutinized by both dental professionals and consumers. The controversy is not a new one; in fact it dates back to the 1800's. Nevertheless, amalgam remains the most widely used restorative material. It is likely that amalgam will remain at the top of the list until longitudinal studies confirm the superiority of other materials (e.g. composite) for posterior restorations. Until that time, the "tried and true" dental amalgam will continue to be popular.

Dental amalgam is produced by mixing mercury with a silver-tin alloy which usually contains a small amount of copper and zinc. An amalgam's characteristics are determined by the components of the particular alloy and their specific chemical combination, the size and shape of the alloy particles, the ratio of mercury to alloy, and manipulation variables such as the trituration (mixing) time and adequacy of condensation. When correctly placed, the alloy has high crushing strength and completely fills the cavity, leaving no voids. Its surface can easily be highly polished so that it will not irritate the gingival tissues. Amalgam is most generally used for posterior restorations where its strength is needed to resist biting stresses and where esthetic properties are unimportant.

There are several causes of excess amalgam extending beyond the margins of a cavity preparation: 1) the amalgam was incorrectly condensed; 2) the condensed amalgam restoration was poorly carved; 3) moisture contamination during the restorative procedure has led to expansion and corrosion of the finished restoration over a period of time; and (4) a natural expansion of the amalgam has occurred over a long period of time. Most of these overextensions are eliminated during the final polishing procedures, although the procedure is sometimes neglected altogether since the restoration cannot be polished immediately after placement of the amalgam. *The finishing and polishing procedures should not be initiated on an amalgam restoration until the amalgam has reached its final set, at least 24 hours after it has been placed and carved.* Premature finishing and polishing will interfere with the crystalline structure of the hardening amalgam. The result will be a weakened restoration. Studies have been conducted on polishing high copper amalgams ten minutes after placement; however, it is presently recommended that at least 24 hours pass before the polishing procedure is attempted.

Single restorations may be polished at the next recall appointment. Multiple restorations should be polished at a specific polish appointment. An amalgam restoration is not considered complete until it is polished.

SELECTION OF RESTORATIONS TO BE POLISHED

All amalgam restorations must be evaluated carefully prior to polishing to determine if they are serviceable and what, if any, modifications are necessary. If there is doubt about the acceptability of their condition, they should be evaluated by a dentist for replacement.

Most newly placed amalgams will easily pass the criteria for acceptability; however, occasionally something will have occurred during placement or in the interim between the placement and polishing appointments which makes the amalgam a candidate for replacement (e.g., fracture, etc.). Older amalgams indicated for polishing should be evaluated carefully using the same criteria established for new amalgams. The criteria for serviceable amalgams that indicate polishing include:

1. *No fractures in the restoration.* When evaluating the restoration(s) to be polished, carefully assess it both visually and tactilely in good light. Dry the restoration if it is wet. Notice the rough non-reflective appearance of the surface. Look for fractures on the occlusal surface and marginal ridges. Use a mirror and light reflection to improve vision in all areas.

2. *Proximal contact is present in Class II restorations when tooth position makes it possible.* The contact area is checked by passing a piece of dental floss through it. Floss through the contact area just as if you were flossing to remove plaque. You should feel a slight resistance to passage through the contact area. In most cases extreme resistance or no resistance indicates the contact is not correct. Very tight contacts may be improved during the polishing procedure but lack of contact when one should be present indicates the amalgam should be replaced. Open contacts trap food and debris and may lead to the breakdown of the periodontium in the area. The height and contour of the contact is evaluated visually to determine if any modifications are necessary.

3. *The anatomy can be maintained or improved.* Be aware that occasionally a patient's dental anatomy, occlusion or tooth position is vastly different from normal, ideal anatomy. In these cases the anatomy of the restoration is usually modifed to suit the situation when it is being placed. This may mean the anatomy will be much flatter than normal or the height or position of a cusp or ridge may be modifed. Perhaps the contact is in an unusual place. A look at the anatomy and position of the patient's other teeth will help you evaluate the appropriateness of the anatomy and occlusion of the restoration to be polished. Before making any alterations in anatomy confirm your decision with the supervising dentist.

Some examples of anatomy that could be improved during the polishing procedure include: bulky embrasures, broad contact areas, high areas of amalgam that contact first (premature contacts), marginal ridges that extend beyond the height of occlusion (if a marginal ridge is excessively high, it is likely that it will fracture from occlusal forces), and indistinct anatomy.

On the other hand, excessively deep occlusal anatomy or marginal ridges below the plane of occlusion cannot be improved by finishing and polishing procedures and are, therefore, contraindicated for polishing.

4. *All margins can be contoured to be flush with the cavosurface margin of the cavity preparation.* Using an explorer, look and feel for excess amalgam or areas where amalgam is deficient at the margins. If the margin is rough and ragged rather than following the smooth line of the cavity preparation, there is most likely flashing and/or ditching present.

Flashing is an excess of amalgam which extends over the cavosurface margin of the cavity preparation. If the tip of the explorer catches when moving from tooth structure to amalgam but not from amalgam to tooth, it indicates there is an excess of amalgam which needs to be removed. If the flashing appears at the gingival margin of the restoration it is commonly referred to an an overhang.

Ditching is a deficiency of amalgam along the margin, preventing the margin of the cavity preparation from being flush. If the explorer tip catches going from amalgam to tooth structure, but not from tooth to amalgam, it indicates there is inadequate amalgam at the margin. An area of ditching is also commonly referred to as a submarginal area and it requires removing tooth structure or replacing the amalgam to correct the situation.

If the tip of the explorer catches when moved in both directions across the margin, it indicates there is an open margin (there is a distinct space between the amalgam and the wall of the cavity preparation) and the amalgam should probably be replaced. Figure 5 depicts flashing, ditching, and open margins.

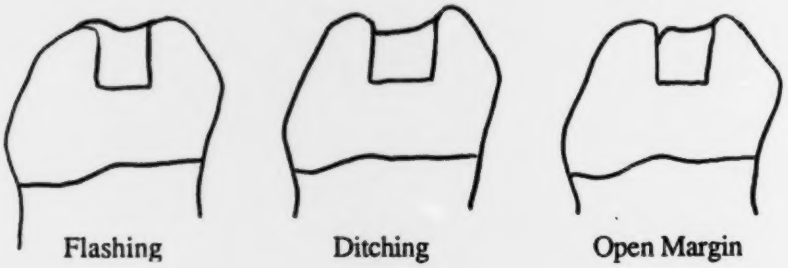

Figure 5. Flashing Ditching Open Margin

At the completion of the polishing procedure, all of the margins should be flush (the explorer moves smoothly in either direction with no catching at all); areas with excess amalgam can be finished. Margins that are slightly deficient require the removal of enamel to assure smooth flush margins. According to Idaho state law, dental assistants or hygienists are not allowed to remove tooth structure. As such, the supervising dentist must remove tooth structure as needed. Margins that are greatly deficient or open cannot be corrected during the polishing procedure and are considered contraindications to polishing.

5. *The occlusion can be maintained or improved.* Occlusion must be checked prior to isolating the teeth involved in the procedure to determine what, if any, modifications must be made to correct it. The occlusion can be checked visually to identify shiny burnished areas on the amalgam where the restoration has become worn because it prematurely contacts the opposing teeth. Occasionally these areas look flat due to the premature occlusion. These areas are called wear facets. Wear facets should be polished down to correct the occlusion.

Examples of restorations that are *contraindicated* for polishing that do not fit into one of the five categories above include: 1) restorations with gross overhangs that need to be replaced; 2) restorations in teeth to be extracted or crowned; and 3) restorations with recurrent decay that need to be replaced.

PRINCIPLES OF POLISHING

Finishing and polishing the restoration can be divided into two separate procedures performed with different abrasive agents. Finishing the restoration involves contouring, removal of marginal discrepancies, defining the anatomy, and smoothing the amalgam surface. Polishing enhances the quality of the restoration by producing the smoothest and shiniest surface possible--one which will offer better resistance to corrosion and tarnish. These procedures are significantly interrelated and can be distinguished by the abrasive used. Finishing procedures are completed prior to polishing and require abrasive agents that are coarse enough to remove the bulk from the surface. Polishing procedures require more mildly abrasive materials for smoothing and shining the amalgam surface.

An abrasive changes the surface of the tooth by frictional grinding, rubbing, scraping, scratching, etc., to remove irregularities. As this process proceeds from coarse abrasion (finishing) to very fine abrasion (polishing), the surface of the restoration passes through various stages: from an irregular surface, to a grooved surface, to a finely scratched surface which is much smoother and better reflects light. The last state, finely scratched surface, is regarded as the polished surface and, to the human eye, will appear as a high shine. Therefore, it is extremely important to use abrasive agents in the order of decreasing coarseness, concluding with the least abrasive material. The likelihood of achieving a high shine with a mirror-like finish is decreased if very coarse abrasive agents are immediately followed by fine abrasive agents. The fine abrasive agents will not remove the large, deep scratches left by the coarse abrasive agents.

Factors determining the abrasiveness or polishing potential of an agent include its hardness, size, shape, and concentration of abrasive material. Different abrasives vary considerably in their hardness and shape. Within the same abrasive, sizes are graded from coarse to fine. With abrasive compounds that are harder, of rougher shape, increased particle size, or high concentration, abrasiveness is increased. For example, both garnet disks and cuttle disks are available in coarse, medium, fine, and extra fine varieties. However, garnet is more abrasive than cuttle because of its hardness, size, and shape. As such, a coarse garnet disk will remove many more irregularities than will the coarse cuttle disk.

Additional factors which relate to abrasiveness must also be considered. These include the pressure and speed used to apply the abrasive material. The greater the pressure or speed used while applying the abrasive, the greater the friction which results in the production of heat. **The creation of heat during the polishing procedure is potentially dangerous** for two reasons: 1) heat can cause thermal damage to the pulp (and pain to the patient!); and 2) heat brings the mercury to the surface of the restoration which results in a dull, cloudy surface, and a surface that is more susceptible to corrosion.

To minimize heat production:

1. Use light, intermittent pressure with rotary instruments lifting the instrument off of the restoration frequently. Heavy or prolonged pressure generates heat.
2. Use slow to moderate speed with rotary instruments. High speeds increase friction and thus generate more heat. Increase speed only to produce the final high shine.
3. Use abrasive agents that are wet rather than dry. Some abrasive materials (pumice and tin oxide, for example) can be mixed with water or alcohol to help lubricate and cool the agents.

4. Use compressed air directed at the amalgam surface during polishing.

PRECAUTIONS

The patient's health and safety are your responsibility during this procedure. It is the moral and ethical responsibility of every dental auxiliary engaged in polishing amalgam restorations to prepare her/himself carefully to perform at a high standard of competence. One of the most important precautions to be aware of during this procedure - the minimization of heat production - is discussed above. There are several other important precautions which should be taken during this procedure to prevent damage to the tooth, the restoration, and the patient's soft tissue:

Maintain functional anatomy by using polishing instruments in the prescribed manner. Do not destroy functional anatomy by flattening cusps or marginal ridges, by removing the contact, or by ditching or grooving the restoration. To prevent loss of anatomy:

1. Start all rotary instruments just prior to touching the restoration.
2. Keep instruments moving over the surface.
3. Use short overlapping strokes.
4. Use each polishing instrument on the surface it was designed for.

Do not weaken the restoration by improper contouring. Excessively deep grooves and pits, flattened embrasures, excessive reduction of marginal ridge heights, and excessive removal of amalgam around the cavosurface margins are examples of damaging the original tooth anatomy by improper use of the burs and disks. Too much pressure and improper direction of force on the tip of a bur can cause gouging and/or grooving of the amalgam surface. The application of excessive pressure in one area or lack of movement of any bur or disk can also cause undesired grooving.

Prevent damage to the patient's soft tissues. Some of the abrasive materials used for this procedure (particularly disks and finishing strips) can be very painful and/or damaging to the patient if the operator should accidentally "slip" off the tooth. To avoid such situations always:

1. Retract the tongue, cheeks and lips during the procedure.

2. Position instruments so they will not abrade or lacerate gingival tissues while polishing.
3. Use a secure grasp and stable fulcrum with all instruments.
4. Rinse all abrasive agents out of sulcus area and mouth after polishing.

Protect the patient from polishing debris. Protect the patient from the possibility of aspirating polishing agents and debris by carefully vacuuming up all materials as they accumulate. Prevent potential damage to the patient's eyes from flying debris by having the patient close his eyes or provide a shield (e.g. glasses, a towel, etc.) during the procedure. In addition, do not carry instruments or other armamentarium over the patient's eyes or face.

ARMAMENTARIUM

There is a wide variety of instruments available for recontouring, finishing, and polishing amalgam restorations. Because many of the instruments serve essentially the same purpose and achieve duplicate results, it is important to select a few instruments that can be adapted to the majority of clinical situations. Limiting the number of instruments will help keep the technique simple and will contribute to speed and efficiency in performing the procedure. This section of the module will describe armamentarium that is recommended for the particular technique presented in this module.

Basically, the instruments can be divided into rotary instruments and hand instruments. As discussed previously, the more abrasive materials are used for recontouring and finishing, while the mildly abrasive materials are used for the final polishing to achieve a high shine. There is a large variety of materials/instruments available--the list is limited only by operator preference--and it is not the intent of this module to describe all of the available instruments.

Rotary Instruments. The most commonly used rotary instruments are abrasive stones, disks and finishing burs. They are available in a variety of shapes, sizes, degrees of abrasiveness, and in either high speed or slow speed. To reduce the frictional heat and thus minimize the potential for damage to the tooth and/or restoration, the technique described in this module recommends the use of a slow speed handpiece rather than a high speed handpiece. The choice of abrasive stones, disks, and burs is dependent upon the size of the restoration, the adaptability to the tooth surface, and the amount of amalgam to be removed. Figures 5 and 6 show the rotary instruments that are used for the technique described in this module.

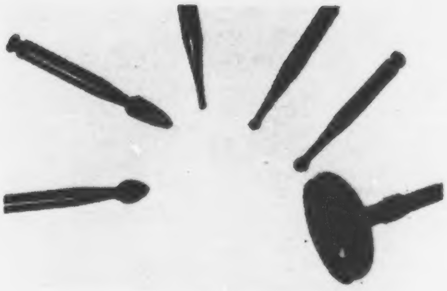

Figure 6. Rotary instruments used for recontouring and finishing.

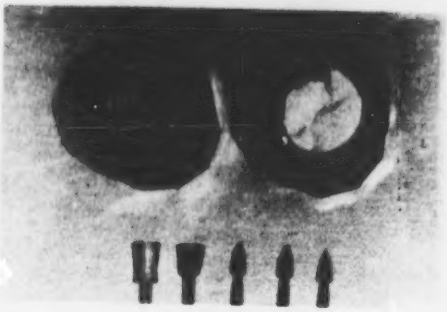

Figure 7. Rotary instruments used for final polishing.

a. Green stones are available as tapered points, pear shape, round, or a variety of other shapes. They are usually composed of silicon carbide, which is a very abrasive material. They are, therefore, fast cutting and produce a moderately rough surface. Since the green stone is harder than enamel, care must be taken not to scratch the tooth surface. Green stones are not necessary for all amalgam polishings. They are used for reducing bulky amalgam, (e.g., premature contacts, recontouring inadequate anatomy, reducing gross flashings). Hopefully, if the amalgam has been recently placed, the carving procedure will not require removal of bulky amalgam necessitating the use of a green stone. Frequently older amalgams will require a green stone as part of the polishing procedure.

b. Finishing burs differ from cutting burs (used for cavity preparations) in that their blades are finer, their sizes smaller, and their number of blades greater. They, too, are available in a variety of shapes and sizes. The small round bur (#1/2 or #1) is very useful for defining and smoothing the grooves and fossae of the restoration. It is recommended that a #4 or #6 (whichever best fits the area) finishing bur is used to smooth the cavosurface margins and smooth the occlusal amalgam surface. Finishing burs should be operated in the burnishing direction rather than cutting direction. To test the direction of the bur, use a plastic test stick (or fingernail if in the laboratory situation). If it "grabs" or "catches" it is moving in the cutting direction. Adjust your handpiece to reverse the direction that the bur is rotating--the bur should now run smoothly across the plastic test stick rather than grab.

c. Finishing disks are also available in a variety of sizes and grits. The appropriate disk is determined by the amount of excess to be removed and by the accessibility to the area. Use of a medium grit disk is always followed by the application of a finer grit disk which cuts less. Disks are used primarily on the proximal, buccal, or lingual surfaces. Because of their flatness, they are not routinely used on the convex and concave areas of the occlusal surface.

Disks have a hole in the middle which is either plain (to allow it be used with the screw-on type mandrel) or the hole has a metal rim to allow it to be snapped or popped directly onto the head of the mandrel. Select the type of disks which may be used with the mandrel you have selected. The disks may be mounted on the mandrel so the abrasive faces either toward the contra angle or away from it depending on the accessibility of the area being polished.

Because the rotary instruments (other than burs) do not have blades, all rotary instruments may be run in the same direction as the finishing bur. The only exception to this is the finishing disks. Sometimes it is necessary to change the direction of the finishing disks. You will know when to change direction--the disk will "grab" in the interproximal area. Stop and reverse the direction of your handpiece to avoid damaging the restoration or adjacent tissues.

Hand Instruments: The cleoid end of a discoid-cleoid hand instrument (not shown here) is often used to smooth the base of the grooves and/or fossae when a small bur cannot reach the depth of them. It may also be used to smooth the cavosurface margins. Finishing strips, while not necessarily an "instrument" may fit into this category. They are used to smooth the gingival margin and interproximal surface below the contact area of a Class II restoration. Finishing strips are usually either plastic or linen coated with an abrasive on one side. The abrasive comes in various textures and the strips in a variety of widths. A narrow strip with fine abrasive material is recommended for most situations since the space in the interproximal area is usually limited and the abrasiveness required to polish this surface should be minimal. If the strip does not have an abrasive-free area in the middle of the strip where it may be passed through the contact area without removing amalgam or enamel, it should be tapered to a point on one end with a pair of scissors to facilitate passing it through the interproximal area below the contact point.

Polishing Agents: Pumice and tin oxide are two commonly used polishing agents. Pumice is an abrasive powder of volcanic origin and is available in a variety of grits. Fine grades of pumice are used for polishing amalgam restorations. It is usually mixed with water (slurry of pumice) to help reduce the heat created by the friction of the abrasive particles during polishing. Tin oxide or Amalgloss® is used as the finest abrasive agent. It may be applied in a slurry, applied dry, or applied first as a slurry followed by dry tin oxide. Both pumice and tin oxide are applied to the tooth with separate rubber polishing cups.

Other polishing agents are available in the form of abrasive-impregnated rubber points and cups (Shofu® Brownies, Greenies, Super Greenies). These points and cups are very easy to use, readily adapt into all areas of the restoration, and are less messy than the pumice and tin oxide. The drawbacks to their use are expense and the fact that the rubber contributes to heat generation (refer to precautions for minimizing heat production). They are to be used in the following order (most abrasive to least abrasive): Brownies, Greenies, followed by Super greenies.

There are no unique aseptic procedures required for finishing and polishing amalgams. The same precautions for patient and self-protection (e.g., gloves, facemask, eyeglasses) and for sterilization are required for this procedure as for any other intra-oral procedures. All reuseable items should be appropriately sterilized after use, while all contaminated disposable items should be disposed of in a biohazardous waste receptacle.

AMALGAM POLISHING PROCEDURE

This section of the module will introduce one technique for polishing amalgam restorations. Each operator has her/his own favorite equipment and technique for most effectively polishing amalgam restorations. A step-by-step approach is offered so that the student may first become competent with this method, and may then develop her/his own particular technique through practice activities. The following armamentarium is needed for this procedure (see Figure 8):

- mouth mirror
- explorer
- cotton pliers/forceps
- slow-speed handpiece
- contra-angle
- mandrel to fit contra-angle
- polishing disks to fit mandrel:
    - -fine garnet
    - -medium cuttle
    - -fine cuttle
    - -OR assorted Sof-lex® disks
- finishing burs to fit contra angle
    - -#1/2 or 1 round
    - -#4 and #6 round
- green stone
- 2 rubber polishing cups (latch type)
- 2 dappen dishes
- flour of pumice
- tin oxide or Amalgloss®
- Shofu® Brownies, Greenies, Super greenies
- dental tape
- dental floss
- abrasive finishing strips
- saliva ejector
- vacuum tip
- air/water syringe tip
- articulating paper
- supplies for maintaining a dry field:
    - -rubber dam instruments OR
    - -cotton roll isolation (e.g., garmer clamps or other cotton roll holders)

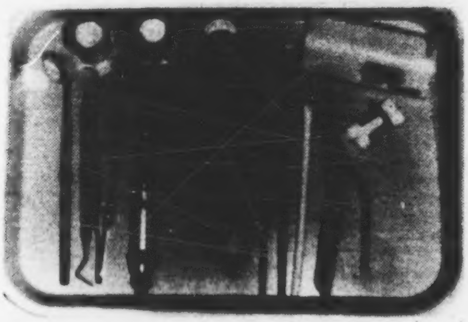

Figure 8. Tray set-up with amalgam polishing armamentarium.

STEP 1. REVIEW PROCEDURE WITH PATIENT

Patients should be carefully educated about the value of the polish procedure. Explain to your patients why you are doing this; what it will do for them; how you are going to do it; and, when you are finished, show them the polished restoration.

STEP 2. EVALUATE RESTORATION TO BE POLISHED

Using an explorer, evaluate the cavosurface margins for marginal integrity (ditching, flashing, open margins). Determine the presence and extent of any marginal discrepancies. Critically evaluate the contour of the restoration. Using a mouth mirror, look at all embrasure spaces to determine the patient's ability to brush or floss around the restoration. Is the health of adjacent tissues being affected because of improper contours? It is helpful to compare the tooth you are working on with the contralateral tooth (same tooth on the opposite side of the mouth) and the adjacent teeth as guides for proper contour. Refer to page 8 of this module for criteria for selecting restorations to be polished. If you have any doubt about the acceptability of a restoration, ask your supervising dentist to evaluate it.

Figure 9. Use an explorer to evaluate the margins of the restoration to be polished.

STEP 3. CHECK OCCLUSION OF RESTORATION

Articulating paper is used to help identify the occlusal pattern. Mark the occlusal contacts in centric occlusion and excursive (side to side) movements. The markings should be of the same intensity as the other occlusal contacts. Areas that need to be reduced will be identified by darker markings on the restoration. Before altering the occlusion of a restoration for a patient confirm your decision to make these adjustments with the supervising dentist.

A tapered green stone may be used to reduce the high spots. Establish a secure fulcrum and, using a slow to moderate speed, start the stone rotating just before applying it to the tooth. The green stone can quickly cut away the amalgam and tooth structure so display caution when using it. Recheck the occlusion with articulating paper frequently to be sure you are not removing too much amalgam thereby taking the restoration completely out of occlusion. Ask the patient if his/her bite feels comfortable. Continue to recheck and adjust if the patient indicates discomfort.

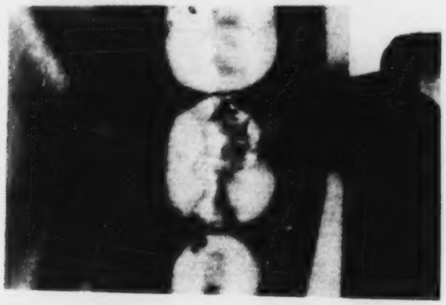

Figure 10. Use a green stone to reduce high spots.

STEP 4. ISOLATE

After proper occlusion has been established, the restorations to be polished should be isolated. A rubber dam is recommended to increase vision and accessibility in the area, control moisture, and help protect the patient's soft tissue by retracting gingival tissues, tongue and lips. The dam also prevents polishing particles from entering the oral cavity and simplifies washing and evacuating debris during the procedure. Generally, patients will not be anesthetized for this procedure; therefore, care must be taken to prevent discomfort from the rubber dam clamp. Occasionally, a little topical anesthetic will be needed on the gingival tissue to maintain patient comfort.

Cotton roll isolation is commonly used during the amalgam polishing procedure rather than a rubber dam. Garmer clamps are very effective in maintaining a dry field. With these clamps, a long cotton roll may be placed in the mandibular vestibule and wrapped in a horseshoe-shape fashion to extend to the maxillary vestibule thus isolating the maxillary and mandibular teeth of the same side at the same time. A garmer clamp also may be used with two short cotton rolls for isolation of the mandibular teeth. Small plastic disposable cotton roll holders are useful in cases where patient management is not a problem or salivary flow is minimal.

STEP 5. REMOVE OCCLUSAL EXCESS

Remove areas of gross flash with a tapered green stone. Rest the side of the green stone against the excess amalgam with the tip in the central groove area, and move the stone parallel to the margin of the restoration. The green stone may also be used to recontour any poorly carved areas. Again, use slow to moderate speed with light pressure being careful not to over reduce the amalgam while using the green stone. Any recontouring or reshaping that is done must blend with the remaining tooth structure.

Because of its abrasiveness, the green stone is used only when a rather major correction is necessary. It is used more commonly on old amalgam restorations and rather infrequently on newly placed amalgams. Therefore, if the occlusion is not high, there is no gross flashing along the cavosurface margins, and/or recontouring is not necessary, the green stone does not need to be used at all for the amalgam polishing.

STEP 6. DEFINE OCCLUSAL ANATOMY

Sometimes the grooves and triangular fossae are not well defined when the amalgam is carved. Although it is not desirable to have deep grooves through the amalgam, they should be well defined and be continuations of the grooves in the tooth. The grooves serve definite functions and should not be omitted. The fossae should extend to a depth consistent with the rest of the occlusal anatomical contours and should be defined accordingly.

Use a small #1/2 or #1 round finishing bur to define the developmental grooves and fossae. Use the side of the small bur to trace down each groove. The grooves should be distinct but not too deep. When retracing the groove with the bur, be careful to trace the bur exactly in the first tracing/groove--do not over trace and put more than one groove in that area. Occasionally, the bur cannot reach to the very depth of a groove. In such a case, the cleoid end (pointed end) of a discoid-cleoid carver can be used to "burnish" the amalgam in these deeper areas. See Figures 11 and 12.

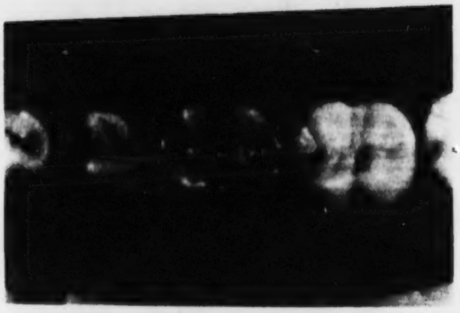

Figure 11. Use a small round bur to define occlusal anatomy.

Figure 12. A discoid cleoid is being used to define grooves.

STEP 7. SMOOTH OCCLUSAL CAVOSURFACE MARGINS

The primary objective of amalgam polishing is to achieve smooth, flush cavosurfaces margins which will resist plaque accumulation and contribute to the health of the tooth and surrounding soft tissues. The margins can be smoothed easily by using a round bur. Choose a #4 or #6 round finishing bur--whichever will best fit the area you are working on. Place the side of the bur against both amalgam and tooth surface. Use medium speed and light pressure to prevent excessive reduction of the amalgam or cutting away tooth structure. Move the bur along all cavosurface margins. This procedure is not designed to reshape, rather it is to assure that the blend of tooth structure to amalgam is perfect. Run the tip of an explorer back and forth across the margins to ascertain if they are smooth and flush.

STEP 8. SMOOTH OCCLUSAL SURFACE

Further smoothing of the amalgam surface is accomplished with the use of a large round finishing bur. Again, choose a #4 or #6, whichever best fits the area you are working on. This step is often times completed in conjunction with step 7 (see Figure 13). If marginal descrepancies are minimal, it is possible to smooth the broad occlusal surfaces and marginal ridges while working on the cavosurface margins. To save time and decrease the possibility of creating unwanted ridges, select the largest bur that will fit the area.

The bur is used to eliminate scratches and graininess from the amalgam. After its use the amalgam should appear smooth and will have a shine. Very minute scratches will still be present (these will be difficult to detect with the human eye), but they will be removed during the final polishing.

Figure 13. The large round bur is used to smooth cavosurface margins and the broad occlusal amalgam surface.

This is one of most critical steps in polishing amalgam restorations and is probably the most difficult for beginners, only because they have not yet developed an "eye" for what the surface should look like. Once you have gained that "eye" this step is easy and fun because you begin to see a dramatic difference in the appearance of the amalgam. Using the side of the finishing bur, smooth the entire occlusal surface and marginal ridges. It is suggested that you start working in one area (e.g. the mesio-buccal cusp) and continue in that area until all scratches and irregularities are removed. Then move on to a new area (e.g. mesio-lingual cusp). By so doing, you will be assured of removing all scratches and will get less frustrated than going back over the entire restoration time and time again to remove scratches.

Use light pressure and moderate speed as you move the bur back and forth across all surfaces. Do not hold the bur in one spot too long or use unequal pressure--either case can result in unwanted grooves or ridges in the amalgam. It is important that all strokes overlap each other to prevent that occurrence. Move the bur mesio-distally, overlapping each stroke. Then cover the same area in a bucco-lingual direction, overlapping each stroke (see Figure 14). If you follow this sequence and use equal pressure, the unwanted grooves or ridges will be avoided. Do not move on to a new area of the restoration until the area you are working on is smooth.

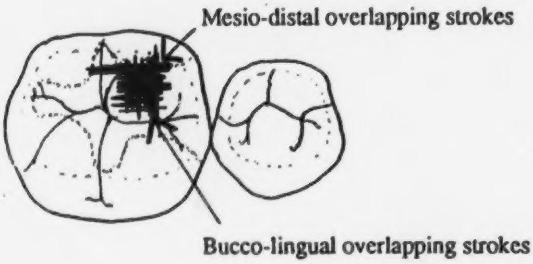
Mesio-distal overlapping strokes
Bucco-lingual overlapping strokes

Figure 14. When using the finishing bur, overlap each stroke to achieve the smoothest surface possible.

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STEP 9. RECONTOUR PROXIMAL AREA

Remove any excess amalgam located in the occlusal embrasure areas with a finishing disk (see Figure 15). The coarseness of the abrasive selected will depend upon the condition of the amalgam surface. A good rule of thumb for new amalgam is to start with a fine garnet followed by a medium cuttle and then a fine cuttle disk.

Figure 15. Recontouring proximal area with finishing disk.

Rotate the disk so it will move from amalgam to tooth structure and will turn up and away from the gingiva. Use very light strokes and stop frequently to evaluate the results. Contour the buccal and lingual embrasures and interproximal surfaces of the restoration. Be careful not to damage the contact area. The disk will cut soft tissue, so avoid getting too close. View from the occlusal, buccal and lingual aspects to assure proper contouring.

STEP 10. SMOOTH PROXIMAL CAVOSURFACE MARGINS AND SURFACE

Check the restoration frequently with the explorer to evaluate the integrity of the margins and to determine the smoothness/roughness of the polished surface. A finishing strip may be needed to complete the smoothing and polishing of the gingival cavosurface margins and interproximal space if these surfaces cannot be reached adequately with other polishing instruments (disks, etc.).

To eliminate the possibility of opening the contact, do not polish the contact area with a polishing strip unless it is extremely tight or broad. Rather, pass the smooth area of the strip through the contact and polish back and forth across the restoration below the contact area while using a stable fulcrum. Be careful in handling the polishing strip as the edge of the strip will easily cut gingival tissues, tongue, or lips.

STEP 12. SMOOTH FACIAL AND LINGUAL SURFACES

Recontour and smooth convex facial and lingual surfaces with finishing disks. Adapt the edge of the disk to the margin of the restoration and, using a light sweeping stroke, move the disk toward the occlusal surface of the tooth. Smooth the amalgam with a less abrasive (fine) disk. When a concave area is involved, such as near the buccal or lingual grooves, use a finishing bur to smooth the area. Select one that best fits the area and use it in the same manner as described earlier (Step 8).

STEP 13. POLISHING THE RESTORATION

The polishing phase consists of first removing the very light scratches remaining after use of the finishing burs. It is achieved by using progressively finer abrasive agents and can be accomplished by the use of a couple of different methods--or a combination of the two methods. Either method is acceptable and both will be discussed.

A. *PUMICE AND TIN OXIDE:* flour of pumice is mixed with water to form a slurry. It is applied to all surfaces with a rubber cup (see Figure 16). Use fairly light pressure and sweeping strokes, adapting the cup to marginal ridges and as far interproximally as possible. Do not hold the cup in one place or use too much pressure as either will create heat. Replenish the moist pumice often since the pumice should do the polishing--not the rubber cup. Rinse and evacuate all pumice from the area. The amalgam should have a smooth, satin finish (dull luster). If deep scratches and irregularities are present, return to the appropriate finishing bur. It may be necessary to use a little more pressure with the bur in the areas where scratches and irregularities are present.

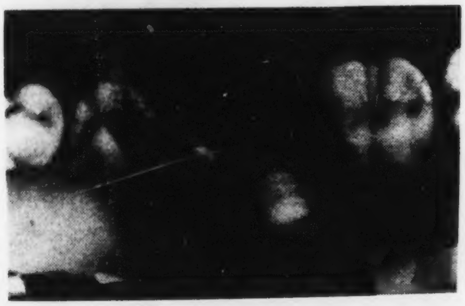

Figure 16. Apply slurry of pumice with rubber cup.

Use waxed dental tape and wet pumice to polish the gingival cavosurface margins and interproximal surface below the contact area (see Figure 17). Floss the tape through the contact area. Then carry the pumice slurry into the interproximal area using your gloved finger. Use a back and forth motion and up and down stroke to distribute the pumice over the interproximal surface to polish. It is critical that all abrasive pumice particles be rinsed away before applying tin oxide.

Tin oxide may be used in a wet slurry or dry (see Figure 18). It is applied in the same manner as the pumice. If you do not change rubber cups after applying the pumice, be certain to wash the pumice out of the cup to remove the coarser pumice particles before applying the tin oxide. Use a light buffing motion and a slightly higher speed with the handpiece to create a shiny, mirror-like finish.

Figure 17. Waxed dental tape with pumice is used to polish interproximal area below contact.

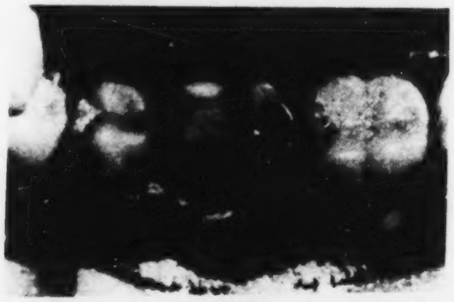

Figure 18. High luster is achieved with the use of tin oxide.

B. *ABRASIVE POINTS:* Adapt the Brownie® abrasive point into the concavities of the occlusal surface and rest the side of the point along the cavosurface margin (see Figure 19). Using light pressure and slow speed, move the point over all areas of the amalgam that are accessible. As with pumice, the surface should be a dull luster after use of the brownie. The abrasive material on these points wears away fairly quickly, leaving a metal shank which can scratch the amalgam. Dispose of the tips before they are worn that low.

Using the same technique as described for the Brownie®, use the Greenie®. The surface will become much shinier, but will not yet have a mirror-like finish (see Figure 20). Repeat above steps using the Super-greenie®. It is the least abrasive of the three points (equivalent to tin oxide), and its use should result in a mirror-like shine on the surface of the amalgam (see Figure 21).

Figure 19. A Brownie® point may be used as a polishing agent to remove fine scratches. Light pressure and slow speed are critical when using abrasive rubber points.

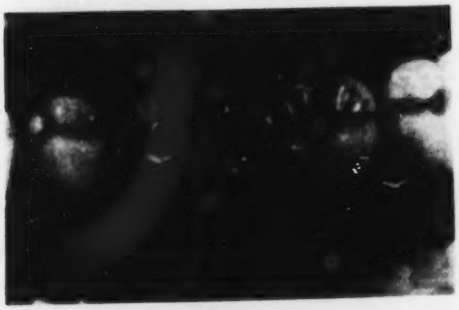

Figure 20. A less-abrasive Greenie® is used following the use of the brown abrasive point.

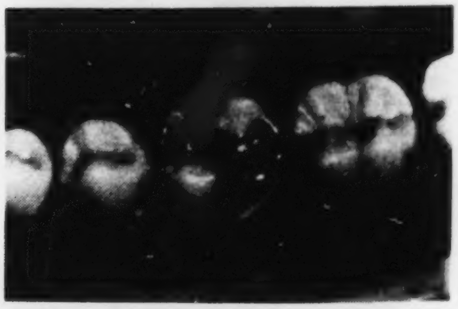

Figure 21. Use a Super Greenie® point to achieve a high shine or "mirror-like" finish.

STEP 14. RINSE AND EVACUATE ALL DEBRIS

Rinse and evacuate all debris completely. Floss the interproximal surface with clean dental floss just as though you were removing plaque from the area to help remove any remaining abrasive from the interproximal space.

STEP 15. EVALUATE POLISHED AMALGAM

Evaluate all margins and surfaces of the restoration to see that the polish meets the following criteria for a finished amalgam polish:

a. The margins are flush with the adjacent tooth surface.

b. The contour of the restoration is consistent with surrounding tooth structure, the contact areas have been maintained, and the grooves are well defined.

c. The entire surface is smooth with no scratches or graininess.

d. The surface is lustrous, with a mirror-like shine.

e. There is no damage to the restoration or adjacent tooth structure.

STEP 16. RECHECK OCCLUSION

Remove the rubber dam or cotton rolls and recheck the occlusion with articulating paper. Have the final product checked by the supervising dentist before dismissing the patient.

STEP 17. CHART ENTRY

The amalgam polish procedure should be legibly recorded in the patient's dental chart. The final chart entry should be in ink, dated, and signed by the person performing the procedure. The chart entry should include the number of each tooth and the names of the surfaces involved (e.g., #30-MO amalgam polished).

STUDY QUESTIONS

Directions: Answer the following questions on a separate piece of paper to the best of your ability. You may use the module to look up needed information. Upon completion of the questions, review all responses to familiarize yourself with pertinent information.

1. Your patient wants to know why his amalgams need to be polished. List four reasons why he should have his amalgams polished.
2. How does polishing an amalgam help to prevent recurrent decay?
3. Explain the difference between tarnish and corrosion. Which is more destructive?
4. How does an improper proximal contact (either too tight or open) contribute to the patient's periodontal breakdown?
5. What are wear facets?
6. What are possible results of leaving a restoration in premature occlusal contact?
7. Why is amalgam so popular for use as a posterior restorative material?
8. List four reasons why amalgam might extend beyond the margins of cavity preparations.
9. After the restoration has been carved, how much time should pass before finishing and polishing takes place?
10. Why is it necessary to wait the time period mentioned in question #9 above?
11. List five criteria that indicate an amalgam is serviceable and acceptable for polishing.
12. List three contraindications for polishing amalgams.
13. Explain the term "ditching."

14. Explain the term "flashing."

15. What is an "open" margin?

16. What is the difference between finishing and polishing? Which is performed first?

17. Why is it important to use abrasive agents in order of decreasing coarseness?

18. What factors determine the abrasiveness of a material?

19. Why is the production of heat potentially dangerous?

20. How can heat production be minimized?

21. Besides minimizing heat production, what precautions should be taken during amalgam polishing procedures? Explain what they are, why each is important, and how to best accomplish each precaution.

22. Which is more abrasive: a green stone or a bur? a green stone or a disk? In what areas and how are they each used?

23. Why might a discoid-cleoid be used?

24. How and why is a disk used?

25. Describe the various polishing agents that may be used for final polishing, their order of use, and the advantages or disadvantages of each.

26. How should a patient's occlusion be checked and altered for amalgam polishing?

27. What are the advantages of using a rubber dam during amalgam polishing?

28. Beside rubber dam, what are other methods of isolating the area?

29. How is the occlusal anatomy (grooves and fossae) defined?

30. Why do the cavosurface margins need to be smoothed? How is it best accomplished?

31. Explain how to smooth the occlusal surface with a large finishing bur.

32. What should the surface look like after each step of the finishing and polishing procedure (i.e. after green stone? after bur? after pumice? after tin oxide? after Brownie®? after Greenie®? after super greenie?)

33. How can the proximal area best be recontoured and proximal cavosurface margins smoothed?

34. Explain how and why a finishing strip is used.

35. Discuss the criteria used to evaluate a polished amalgam restoration.

REFERENCES

Craig, R.G., editor, Restorative Dental Materials, eighth edition, the C.V. Mosby Company, 1989.

Hobbs, E. Amalgam Polish. A Self-Learning Instructional Unit for Dental Auxiliary Education. Published by Kellogg Allied Health Education Project, Office of Research in Medical Education. University of Washington, Seattle, Washington, 1976.

Paarmann, C.S., and Christie, C.R. A clinical comparison of amalgam polishing agents. Dent. Hyg., Vol. 60, No. 7, July 1986.

Spohn, E.E., Halowski, W.A., and Berry, T.G. Operative Dentistry Procedures for Dental Auxiliaries, the C.V. Mosby Company, 1981.

Woodall, I.R., Dafoe, B.R., Young, N.S., Weed-Fonner, L., Yankell, S.L, Comprehensive Dental Hygiene Care, third edition, the C.V. Mosby Company, 1989.

U.S. Department of Health, Education and Welfare. Recontouring, Finishing, and Polishing, HEW Contract No. 231-75-0407. Produced by Quercus Corporation, 1976.

AMALGAM POLISHING
EVALUATION FORM

Clinician________________________ Patient______________________

Date____________________________ Instructor____________________

Tooth # & surface_________________ Score_______________________

Key: C = Criterion Met = 2
I = Criterion Improvable = 1
X = Unacceptable = 0
* = Critical task; if a 2 is not achieved on a critical task, the process evaluation is unsatisfactory and must be redone.

		SELF			*INSTRUCTOR*		
TASK		**C**	**I**	**X**	**C**	**I**	**X**
1.	Margins are flush along the cavosurface margins:						
	a. occlusal	2	1	0	2	1	0
	b. proximal	2	1	0	2	1	0
2.	Contour of the restoration is correct:						
	a. marginal ridge	2	1	0	2	1	0
	b. embrasures	2	1	0	2	1	0
	c. contact area maintained*	2	1	0	2	1	0
	d. groove definition	2	1	0	2	1	0
3.	Amalgam is smooth on entire surface (no voids, scratches, or graininess):						
	a. occlusal	2	1	0	2	1	0
	b. proximal	2	1	0	2	1	0
4.	Amalgam surface is lustrous.	2	1	0	2	1	0
5.	No damage to the restoration, adjacent teeth, or tissue.	2	1	0	2	1	0

________/20

________%

NOTE: Restorations must pass criteria for acceptability before polishing.

Module 4-B

POLISHING AMALGAM

Final Examination

Name______________________
Grade______________________

POLISHING AMALGAM RESTORATIONS
WRITTEN EXAMINATION

Directions: Circle the best answer to the questions below.

1. A highly polished surface of an amalgam restoration will:
   - a. prevent voids
   - b. minimize overhangs
   - c. resist tarnish and corrosion
   - d. all of the above

2. Amalgam restorations should not be polished for at least _____ after insertion to allow the amalgam to completely set.
   - a. 8 hours
   - b. 10 hours
   - c. 18 hours
   - d. 24 hours

3. The term used to describe a discoloration on the surface of the amalgam which does not cause pitting or marginal breakdown is:
   - a. deterioration
   - b. tarnish
   - c. corrosion
   - d. oxygenation

4. Scratches, pits, and irregularities found when closely observing amalgam restorations after polishing, indicates that more work was needed with:
   - a. pumice
   - b. tin oxide
   - c. green stone
   - d. finishing bur

5. If an explorer is passed over the cavosurface margin from amalgam on to the tooth structure without catching, but catches as the explorer is moved from tooth to amalgam, which of the following conditions exist?
   - a. ditching
   - b. submarginal area
   - c. flashing
   - d. open margin

6. Polishing strips are used primarily to polish:
   a. marginal ridges
   b. interproximal surface below contact
   c. occlusal ridges and cusps
   d. occlusal cavosurface margins

7. Which of the following indicates the most appropriate order for using amalgam polishing armamentarium?
   a. green stone, finishing bur, tin oxide, pumice
   b. finishing bur, green stone, pumice, tin oxide
   c. green stone, finishing bur, pumice, tin oxide
   d. green stone, pumice, tin oxide, finishing bur

8. The phrase which best describes the appearance of the surface of the amalgam restoration after polishing it with pumice or a Brownie® point is:
   a. shiny scratches
   b. mirror-like finish
   c. dull, satin luster

True/False: Circle T if the statement is correct; circle F if the statement is incorrect.

T F 9. Pumice is used to give the final luster to amalgam polishing.

T F 10. A disk can be used to give definition to the central groove.

T F 11. Since overheating can result in recrystallization of some of the structure of the amalgam and thus weaken the restoration, wet or lubricated abrasives (e.g. slurry of pumice) are used to minimize temperature rise during the procedure.

T F 12. When polishing amalgam restorations, tin oxide should be followed by a slurry of pumice.

T F 13. Overheating during the polishing procedure is likely to cause trauma to the pulp tissue.

T F 14. Greenie® points should be followed by Super-greenies®, which should be followed by Brownie® points.

T F 15. A discoid-cleoid instrument may be used to smooth developmental grooves.

T F 16. The purpose of recontouring a restoration is to replicate the contour of an "ideal" tooth, not what is natural in the patient's mouth.

T F 17. Light pressure and intermittent strokes should be used to minimize heat build-up.

T F 18. Cuttle disks are more abrasive than garnet disks.

T F 19. A fractured restoration should not be polished.

T F 20. A wear facet appearing on the surface of a newly placed restoration indicates that there is a premature occlusal contact.

ANSWER KEY FOR AMALGAM POLISHING EXAM

1. c
2. d
3. b
4. d
5. c
6. b
7. c
8. c

True/False

9. F
10. F
11. T
12. F
13. T
14. F
15. T
16. F
17. T
18. F
19. T
20. T

Module 5

AIDING IN THE ADMINISTRATION OF NITROUS OXIDE-OXYGEN ANALGESIA

Module 5-A

AIDING IN THE ADMINISTRATION
OF
NITROUS OXIDE-OXYGEN ANALGESIA

Instructor/Student Module

AIDING IN THE ADMINISTRATION OF NITROUS OXIDE-OXYGEN ANALGESIA

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AIDING IN THE ADMINISTRATION OF NITROUS OXIDE-OXYGEN ANALGESIA

INTRODUCTION

This module provides instruction in the administration of nitrous oxide-oxygen for analgesic purposes. The term "nitrous oxide" will be utilized throughout the module to indicate this type of administration.

The technique and procedures described represent one method for administration of nitrous oxide. Several other methods are employed by various practitioners; however, this technique has been selected due to two advantages:

1. It individualizes administration for each patient; and,

2. It has been utilized safely in a number of clinical situations.

The module has been designed to provide necessary instruction based upon the assumption that no previous knowledge exists relevant to the topic. The reader should complete each portion of the module and answer the self-examination included. In this manner, all pertinent information can be understood clearly.

BROAD OBJECTIVES

1. Describe the physiologic effects of nitrous oxide inhalation.

2. Describe the pharmacological effects of nitrous oxide.

3. Explain the indications and contraindications for use of nitrous oxide analgesia based upon a thorough medical and personal history evaluation.

4. Describe the stages of anesthesia and the planes of analgesia including signs and symptoms of each.

5. Discuss and identify clinical symptoms of a patient at the various levels of nitrous oxide sedation.

6. Aid in the proper administration of nitrous oxide to a dental patient.

7. Monitor all signs and symptoms of nitrous oxide sedation in a clinical setting.

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EXPANDED FUNCTIONS FOR THE DENTAL ASSISTANT
AIDING IN THE ADMINISTRATION OF NITROUS OXIDE

COURSE OUTLINE

Course Description

This course is designed to provide the practicing dental assistant with the background knowledge necessary for aiding in the administration of nitrous oxide-oxygen analgesia.

I. Physiologic and Pharmacologic Effects of Anesthesia

II. Side Effects and Adverse Reactions

III. Analgesia vs. Anesthesia

IV. Indications and Contraindications

V. Clinical Manifestations of Analgesia/Anesthesia

VI. Armamentarium Used in the Administration of Nitrous Oxide

VII. Preanesthetic Preparation

VIII. Techniques for Administration

IX. Legal Considerations and Chart Entries

X. Occupational Exposure

XI. Current Literature

The course is intended to involve six hours of lecture. A comprehensive final examination is administered to the students who complete this course. A 75% score is required on the written final examination in order to obtain certification for "aiding in the administration of nitrous oxide." Clinical experience is not required because dental assistants cannot legally administer nitrous oxide-oxygen analgesia.

Required Text

Bowen, D.M. . Aiding in the Administration of Nitrous Oxide-Oxygen Analgesia, Adopted by Idaho State Board of Dentistry and Idaho State Board of Vocational Education, 1991.

Videotapes Recommended for Course:

1. "ADA Telecourse: Nitrous Oxide Sedation." J. Theodore Jastak, D.D.S., Ph.D., Professor of Oral and Maxillofacial Surgery and Head of the Division of Dentistry at the University Hospital of the University of Oregon Health Sciences Center. Not available for purchase. Can be rented from the ADA Bureau of Health Education and Audiovisual Services by calling 1-813-541-4710. Cost of 1991 rental is about $20.00. This telecourse videotape discusses pharmacology and indications and contraindications, stages of anesthesia nd planes of analgesia, equipment, and side effects. It is not intended as a review of techniques for administration.

2. "Introduction to Nitrous Oxide and N20 Overdose," University of Kentucky School of Dentistry. Although this videotape is about a decade old, most of the information presented remains accurate. It provides two demonstrations of nitrous oxide-oxygen administration. The first demonstration shows how to introduce a patient to nitrous oxide-oxygen analgesia for the first time. The second demonstration is particularly valuable because it depicts a N20 overdose so students can see the signs and symptoms leading to it. The course instructor can correct any contraindications with the module by clarifying that the module is more current.

COURSE SCHEDULE

Week 1:	Three Hours	-Physiologic and Pharmacologic Effects -Side Effects and Adverse Reactions -Analgesia vs. Anesthesia -Indications/Contraindications -Armamentarium -ADA Telecourse Videotape
Week 2:	Three Hours	-Preanesthetic Preparation -Vital Signs -Technique for Administration -Legal Considerations -Occupational Exposure -University of Kentucky Videotape
FINAL EXAMINATION		

8. Be aware of methods for handling possible side effects.

9. Discuss legal considerations involved with administering nitrous oxide in the dental office and record proper legal chart entries.

10. List and explain all parts of nitrous oxide equipment and describe necessary care and maintenance.

11. Discuss occupational hazards associated with chronic exposure of dental personnel to low levels of nitrous oxide.

BACKGROUND INFORMATION

Nitrous oxide (N_20) is employed in dentistry for the primary purpose of reducing anxiety in the dental patient. It is estimated that 20 to 40 million adults in America avoid dental treatment because of fear.

The N_20 gas was discovered by Joseph Priestly in 1772. By 1800, Sir Humphrey Davy had discovered its analgesic effect and recommended its use as an anesthetic. In 1844, Gardner Quincy Colton was publicly demonstrating the exhilarating effects of nitrous oxide as "laughing gas" while presenting popular science lectures. Dr. Horrace Wells, a dentist, observed one of these demonstrations and requested that Colton use it on him during dental treatment. Dr. Wells had a tooth extracted while under the influence of nitrous oxide and no pain was experienced! These two men unsuccessfully advocated use of this gas in dentistry from 1845 to 1863.

In 1868, Dr. Edmund Andrews, a Chicago surgeon, established the need to mix oxygen with nitrous oxide for use in operations of long duration. By the turn of the century (1903), Dr. Charles Teter, a Cleveland dentist, had applied this finding to invent the first nitrous oxide-oxygen machine.

After that time, periods of interest in nitrous oxide were followed by periods of little use. Research on the safe administration of nitrous oxide continued. In the 1950's and 1960's, nitrous oxide was becoming more frequently used in dentistry. The first "fail-safe" system was marketed in 1962.

These developments provided the basis for the system of nitrous oxide administration employed in dentistry today. Experiments continue on the physiologic actions and pharmacological effects of this gas. Much information is lacking; however, many questions have been answered during the research process.

Physiologic Effects of Nitrous Oxide

Two essential body systems are involved directly in the physiology of nitrous oxide. These systems include the nervous system and the respiratory system. A review of these systems and their relationship to the effects of nitrous oxide is essential prior to understanding the pharmacological effects of this gas.

The nervous system has two components: the central nervous system (CNS) and the autonomic nervous system (ANS). The CNS includes the brain and spinal cord. Three parts of the brain are involved when nitrous oxide is administered: 1) the cerebrum, 2) the brain stem, and 3) the cerebellum. The cerebrum is responsible for conscious functions of the nervous system. The outer surface of the cerebrum is called the cerebral cortex. The cortex receives sensory information from the skin, eyes, ears,nose, mouth, etc. A person responds to sensations in these regions on the basis of past experience. For example, if a foreign object becomes lodged in the eye, the eye will water and the individual will close it immediately, based on previous experiences of relief when the eye is closed. An infant or young child may not respond as quickly if they had never experienced this sensation. When applying this information to dental pain and anxiety, it can be seen that the patient might react to an oral injection by jerking or turning the head as the cortex receives this sensation from the oral cavity. The brain stem is located at the base of the brain continuous with the spinal cord. It is responsible for several functions which are applicable to the physiologic effects of nitrous oxide. these functions include:

1. the movement and sensation related to controlling the throat, neck and face;
2. the reflex activity involved in breathing;
3. the reflex activity involved in eye movement;
4. the control over the "wakefulness state" of the entire brain; and,
5. the major relay system and integration center for all senses except smell (called the thalamus).

Later in the module, effects of nitrous oxide on each of these functions will be discussed. The major point to consider, at this time, is that all pain sensations are relayed from the thalamus (a part of the brain stem) to the cortex. This is important because pain in the oral cavity will be received in the brain stem and relayed to the cortex for purposes of receiving that sensation. The patient then will react to pain based on the past experience.

If nitrous oxide is to slow pain reaction, or the patient's response to pain, it must have a physiologic effect on these two parts of the brain (i.e., the cortex and the brain stem). The final segment of the brain which is affected by nitrous oxide is the cerebellum. The cerebellum is responsible for a person's orientation in space; therefore, light headedness or a floating feeling may be related to effects on the cerebellum. Patients sometimes respond to nitrous oxide administration in this manner.

The second component of the nervous system that is involved in the physiology of nitrous oxide is the autonomic nervous system (ANS). It is responsible for innervating smooth muscle, viscera and glands which make-up many of the major internal body systems and/or organs. The innervation has a dual effect: increasing the activity of the tissue/organ and decreasing the activity of the tissue/organ. Some of these responses, which might be affected by the administration of nitrous oxide include:

1) dilation/constriction of the pupils,
2) acceleration/deceleration of the heart, and
3) increased/decreased respiration.

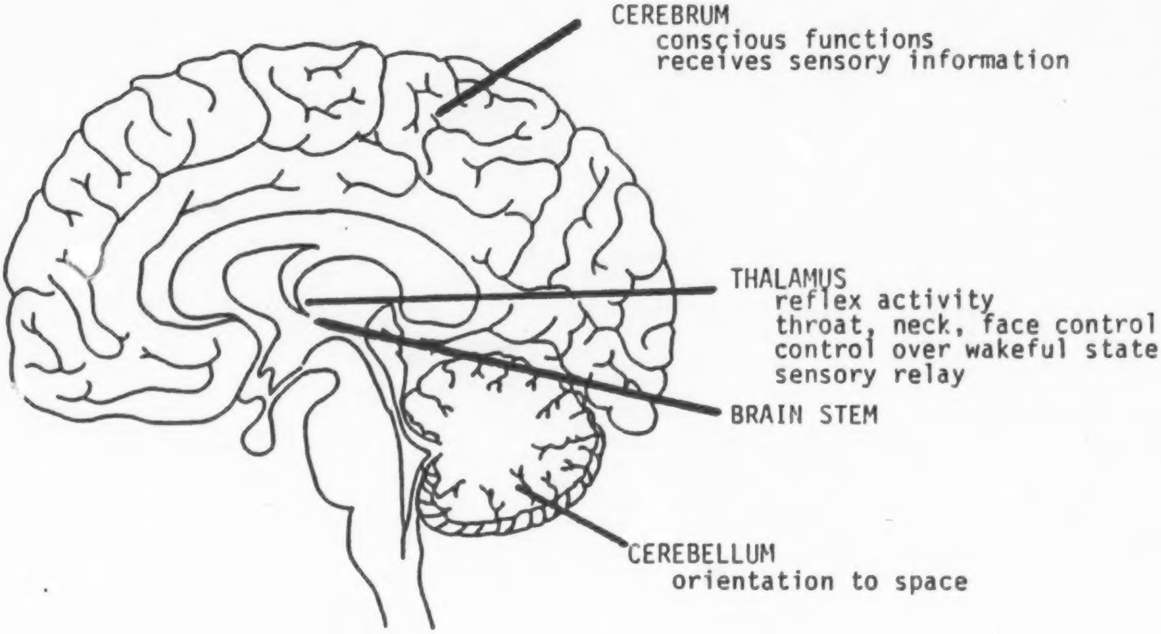
Figure 1 includes a basic diagram of the brain and spinal cord. the major functions of each portion are outlined as a brief summary of the previously presented information relevant to physiology.

The second body system involved in the physiology of nitrous oxide is the respiratory system. Respiration is the transport of oxygen from the atmosphere to the cells and, in turn, transport of carbon dioxide from cells back to the atmosphere. When an individual breathes room air, oxygen is inhaled and carbon dioxide is exhaled.

The respiratory system can be divided into two segments: 1) those parts involved in transporting air from the atmosphere into the lungs and, 2) those parts involved in the exchange of gases from the lung into the blood stream and to the body's cells. These portions of the respiratory system are called "external respiration" and "internal respiration" respectively. External respiration involves the nose, pharynx, larynx, trachea, bronchi, and bronchioles. The final exchange of air from the lungs to the blood stream occurs in the alveolus. The alveolus is a pocket of air surrounded by a thin membrane that contains many capillaries (or small blood vessels). This thin wall is important for the rapid exchange of gases from the lung to the blood. There are 300 million alveoli (plural for alveolus) involved in respiration.
Air is filtered, humidified and warmed as it travels to the lungs. It moves from the external environment through external respiration because of differences in pressure within the respiratory system. The inhaled air moves through the nose and throat, down the trachea

FIGURE 1

THE BRAIN


CEREBRUM
conscious functions
receives sensory information
THALAMUS
reflex activity
throat, neck, face control
control over wakeful state
sensory relay
BRAIN STEM
CEREBELLUM
orientation to space

to the lungs. Once the air reaches the lungs, it travels through the many smaller chambers until it reaches the smallest ones called the alveoli of the lungs. Here, gases are absorbed from the lungs into the blood stream. The blood stream carries oxygen to individual tissues and cells and the cells use it to complete their designated function. The cells undergo their own process of respiration and return carbon dioxide to the blood stream. The carbon dioxide is transported back to the lungs and exhaled into the atmosphere. Expired air has a higher concentration of carbon dioxide (4.0%) than inspired air (0.4%).

Normally, 97 percent of oxygen transported from lungs to tissue is carried by a chemical bond to hemoglobin. Hemoglobin is a pigment of the red blood cell. Oxygen uses this mechanism to attach to a red blood cell and be transported through the blood stream. In this way, hemoglobin buffers (i.e., reduces shock) oxygen to control air pressure in the tissues.

Sometimes breathing and respiration are not normal. A person may breath more or less rapidly than normal; or a person may breath normally, but respiration may not be completed properly due to some type of complication. The following terms are related to breathing and/or respiration and are defined here for clarity:

1. eupnea - normal breathing;
2. tachypnea - rapid breathing;
3. bradypnea - slow breathing;
4. hyperpnea - over respiration;
5. hypopnea - under respiration;
6. anoxia - total lack of oxygen;
7. hypoxia - decreased oxygen in tissue.

The effect of nitrous oxide on breathing and respiration will be discussed later in the module. At this time, the information relevant to physiology should be reviewed and understood prior to proceeding to the pharmacology of nitrous oxide.

Pharmacologic Effects and Properties of Nitrous Oxide

Nitrous oxide is a nonirritating, colorless gas with a sweet taste and odor. It is dispensed a liquid under pressure in a container which is always marked BLUE for identification. The gas is stable at normal temperatures; it is non-flammable, but will burn readily if ignited. Nitrous oxide is soluble in water. It is a relatively safe gas; however, all gases should be handled with caution.

Nitrous oxide is a true general anesthetic and meets all of the properties of anesthetics. It is the least potent of all anesthetic gases. For example, halogen (an anesthetic gas used for surgical depth anesthesia in operating rooms) is 100% potent. Nitrous oxide is approximately 15% potent. The fact that N_20 is a weak agent is beneficial for its use in dentistry because of its wide margin of safety.

The exact mechanism by which anesthetics act on the brain is unknown. Nitrous oxide travels through the respiratory system from the nose to the lungs in the same manner as oxygen. The gas is transferred into the blood stream through the alveoli in the lungs. The difference between respiration of nitrous oxide and respiration of oxygen is found in the transport of nitrous oxide through the blood stream. Rather than attaching to hemoglobin for transport (as oxygen does), nitrous oxide travels through the blood stream in a free gas state, without combining with any cell or portion of a cell. Nitrous oxide replaces nitrogen (N_2) in the blood and because it is much more soluble than nitrous or oxygen, large volumes of N_20 are absorbed. Total saturation in the blood occurs within 3 to 5 minutes of N_20-0_2 administration. This fact is important because a patient may not react to initial administration within this time period. The clinician should be cautious about increasing the N_20 concentration until maximal clinical effect has occurred.

At one time, it was thought that the anesthetic effect of N_20 was caused by a decrease of oxygen (hypoxia) in the cells of the brain. It is now known that N_20 can, even in the presence of adequate oxygen, cause an effect on the central nervous system (brain and spinal cord). Tissues with a greater blood flow--such as the brain, heart, liver and kidneys--will receive greater amounts of N_20 and absorb higher concentrations because the blood supply is saturated with the gas; thus, brain cells will react most readily to administration of nitrous oxide. The cerebrum, thalamus and midbrain functions discussed previously will be depressed when N_20 inhalation anesthesia is delivered.

Because of the depressing action of N_20 on the brain, signs and symptoms of nitrous oxide can be related to the CNS. Somnolence is the production of sleep. Since the brain stem is responsible for the "wakefulness state" of the brain, this symptom of N_20 can be correlated with effects on the brain stem. Dissociation, or a distorted spatial orientation, can be related to the function of the cerebellum since it is responsible for orientation in space. Finally, decreased sensory perception, which reduces a person's ability to perceive pain, can be correlated with effects on the thalamus and cortex. Remember, all pain sensations are relayed from the thalamus to the cortex. Almost all forms of sensation are depressed including not only pain but also sight, hearing and touch. Memory also is dulled with degree of amnesia depending on concentration of N_2O administered.

The uptake of nitrous oxide by other tissues with a lesser blood supply than the brain, like muscle and fat, absorb only a very small amount of N_2O. For this reason, recovery from nitrous oxide after its administration is relatively fast. Only minute traces of nitrous oxide (1%) can be found in the blood several hours after administration.

As mentioned previously, the total circulation time for one breath of N_2O is three to five minutes. This means that the gas is absorbed into the blood stream, transported through the body and returned to the lungs at a fairly rapid rate. Likewise, the diffusion of N_2O from the blood stream after administration is terminated is quite rapid. If the patient is permitted to breath room air at this time, a phenomenon called "diffusion hypoxia" occurs. Diffusion hypoxia causes decreased oxygen and results in nausea, headache and lethargy--or a "hangover" feeling. In order to prevent it, the clinician must always administer 100% oxygen to a patient for at least three to five minutes immediately following administration of N_2O. Oxygen is administered until the patient regains normalcy; recovery is rapid and complete and negative side effects are prevented.

When administered properly, N_2O-O_2 has little effect on other parts of the central nervous system, on the cardiovascular system, or on the respiratory system. There are no changes in heart rate (pulse) or blood pressure. Changes in respiratory rate are related more to the relaxation of the patient than to the nitrous oxide itself; it is nonirritating to the lungs. With higher concentrations of nitrous oxide, greater than 70%, hypoxia can occur. Depression of heart rate, respiration and brain functioning can occur. For this reason, it is imperative that appropriate levels of nitrous oxide and oxygen are administered. Side effects can be avoided with proper techniques and concentrations.

Pharmacologic effects of N_2O-O_2 will differ between patients. Average effects with various concentrations of N_2O are:

100% will produce anoxia.

80% will produce hypoxia with hallucinations and bizarre dreams; may cause respiratory, cardiovascular, kidney or liver damage.

65% can cause patients to enter the excitement stage.

35% usually provides maximum analgesia with maintenance and cooperation of the patient.

25% is claimed as analgesic as 10mg morphine sulphate.

Because the needs of individual patients will vary, the trituration method is recommended for administration of N_2O-O_2. In this method, the concentration of N_2O is slowly increased until the patient has reached an acceptable level of analgesia. Concentrations over 50% should not be administered without special consideration.

Side Effects and Adverse Reactions

As stated previously, side effects can be minimized or prevented with proper administration. Nausea is the most common side effect. Its incidence increases:

1. with prolonged administration or rapid induction,
2. with higher concentrations of N_2O,
3. following a heavy meal,
4. following fasting (empty stomach),
5. in motion sickness sufferers or patients with previous history of vomiting.

Nausea can be prevented by using the lowest effective concentration, administering oxygen every 45 minutes during prolonged procedures, suggesting that patients eat a light meal prior to the appointment, and avoiding use in patients with motion sickness or with a previous history of vomiting.

Adverse reactions associated with N_2O are infrequent. When concentrations below 50% are used and nitrous oxide is administered by the trituration method, the record of patient safety is excellent. Clinicians must be careful not to become complacent, however, assuming that N_2O is harmless. The potential for adverse reactions increases with improper administration and with higher concentrations.

The following are known adverse reactions which can be prevented:

1. **Hypoxia**: most obvious and immediately lethal effect. Always administer enough oxygen. Check analgesia machine regularly, and especially after refilling tanks, to be sure fail safe system is operating correctly. Also, be sure to fully oxygenate patients upon completion of administration in order to prevent diffusion hypoxia.

2. **Bone Marrow Depression**: nitrous oxide may have some cytotoxic effect in humans, especially with increased frequency of use. This hazard may not be relevant to dental inhalation unless a patient receives frequent and prolonged exposures to N_20. But, dental personnel who frequently use N_20 should be concerned.

3. **Pressure/Volume Effect**: N_20 diffusion into any air-containing body cavity temporarily increases either the volume or the pressure in the air space. These changes can affect the middle ear and auditory acuity, intestinal gas volume leading to gastrointestinal distention, or air emboli in the blood stream.

4. **Psychologic Reactions**: particularly hallucinations or claustrophobia. Patients with a history of psychiatric disorders should not receive N_20 without special consideration and medical consultation. Also, since dreams and hallucinations associated with N_20 are sometimes sexually oriented, the operator should not be alone while administering it.

5. **Fire**: N_20 is combustible. Be particularly careful when using electrocautery. Also, never allow grease to contact valves of N_20 tanks.

6. **Protective Reflexes**: present knowledge is incomplete. It seems that normal protective reflexes remain intact, yet reactive gag reflexes of anxious patients are reduced. Methods for prevention of airway complications are recommended.

REMEMBER: The safety of any pain control technique depends upon the health status of the patient, the inherent toxicity of the drug used, and the competence of the practitioner.

ANESTHESIA AND ANALGESIA

As stated previously, nitrous oxide is classified as an anesthetic; however, many dental practitioners refer to it as an analgesic. The terms anesthesia and analgesia need to be understood prior to discussing the administration of this drug.

Anesthesia produces a lack of all sensation. When an injection is given for local anesthesia, the nerve is blocked and the patient does not feel pain in that particular area. Surgery is often performed under a general anesthetic and the patient is unconscious, thereby producing a total lack of sensation. **Analgesia** creates a decreased ability or inability to perceive pain. Total analgesia completely eliminates a patient's reaction to pain. **Relative analgesia**, which is accomplished in dentistry through the use of nitrous oxide, decreases a patient's pain reaction; but, the patient is able to cooperate. **Sedation** is the calming of a nervous apprehensive patient without loss of consciousness.

General anesthetics can be employed to various levels to produce analgesic results or anesthetic results depending upon desired effects. There are four stages of anesthesia. An explanation of each stage follows.

Stages of Anesthesia

I. **Analgesia**: the patient is conscious, comfortable and cooperative. Pain reaction is decreased.

II. **Delirium**: this is the excitement stage. The patient becomes extremely stimulated, raged and possibly angry. Loss of consciousness begins in Stage II. Delirium is an undesirable effect; therefore, it should be avoided.

III. **Surgical**: at this point, the patient is unconscious and life support is required. There is a total lack of sensation.

IV. **Respiratory Paralysis**: death occurs in this stage.

When a general anesthetic is administered for surgery, the patient is brought through the first two stages rapidly and maintained in stage three. Any of the general anesthetics, however, can be utilized to maintain a patient in stage one: analgesia. Nitrous oxide is particularly good at this level because it is a relatively weak general anesthetic. In dentistry, nitrous oxide most commonly is utilized at analgesic levels. This is why many practitioners refer to nitrous oxide as an analgesic even though it is classified as an anesthetic.

The stage of analgesia has been divided further into three planes. Each plane has a variety of possible signs and reactions; although, all of them probably will not be seen in one particular administration. A list of clinical manifestations for each plane of analgesia follows.

Planes of Analgesia: Clinical Effects

1. Plane 1

   a. Patient appears normal, relaxed, awake.

   b. Patient may feel slight tingling in toes, fingers, tongue, or lips.

   c. Patient may giggle.

   d. There are no definite clinical manifestations.

   e. Vital signs remain normal.

2. Plane 2

   a. Patient may have dreamy look

   b. Reactions of patient are slowed.

   c. Partial amnesia may occur.

   d. Voice will sound "throaty".

   e. Patient will feel warm and drowsy.

   f. Patient may drift in and out of environment.

   g. Patient may hear pleasant ringing in ears.

   h. Vital signs remain normal.

   i. Pain is reduced or eliminated but touch and pressure is still perceived.

   j. Patient is less aware of surroundings; sounds and smells are dulled.

3. Plane 3

   a. Patient becomes angry with hard stare.
   b. Patient's mouth tends to close frequently.
   c. Patient no longer cooperates.
   d. Patient is totally unaware of surroundings.
   e. Patient may hallucinate.
   f. Patient's chest may feel heavy.
   g. Sensation of flying or falling or uncontrolled spinning.
   h. Pupils may dilate.

It is essential that clinicians who administer nitrous oxide become totally familiar with the signs and symptoms of each plane in order to maintain a patient at the desired level. In most cases, plane two will be ideal. The patient will be comfortable, pain reaction will be decreased or eliminated and the patient will be able to cooperate. Plane three is undesirable because, at this point, the patient is approaching stage two of anesthesia (delirium). If the patient is in deep plane two, approaching plane three, he/she will not hear you or the mouth will tend to close. The patient also may not be able to follow instructions. At this point, the concentration of nitrous oxide should be reduced so that the patient is maintained in plane two. These symptoms might occur before plane three; but, pain will still be perceived. Tables 1-3 describe clinical manifestations in each plane of analgesia. Each clinician involved in the monitoring or administration of nitrous oxide must be able to recognize clinical manifestations in each plane of analgesia in order to monitor the patient's response. Be sure to study the information presented in this section and in these tables prior to proceeding to the next segment of the module.

TABLE 1

THE PLANES OF ANALGESIA:
PLANE 1

CHARACTERISTICS	PATIENT REACTION
Respiration	Normal and regular
General Muscles	Normal
Eyes	Pupils normal and contract normally to light; conjunctiva sensitive
Pulse Rate	Normal
Blood Pressure	Normal
Patient maintains an open mouth without mouth props	Yes
Patient follows directions	Yes
Degree of Amnesia	Very slight
Effect on Pain	Elevation of pain reaction threshold
Effect on Fear	Diminished
Appearance of Patient	Normal; relaxed, a fully conscious patient
Subjective Reactions	A feeling of relaxation; may experience tingling in fingers, toes, lips and tongue
Gag Reflex	Reduced

NOTE: Some patients prefer Plane 1, especially if they are apprehensive about N_2O effects, or unfamiliar with feelings of sedation.

TABLE 2

THE PLANES OF ANALGESIA:
PLANE 2

CHARACTERISTICS	PATIENT REACTIONS
Respiration	Normal, but breathing may be slower due to relaxation
General Muscles	Normal, but relaxed
Eyes	Pupils normal; rate of winking reduced; a relaxed dreamy, far-away look
Pulse Rate	Normal
Blood Pressure	Normal
Patient Maintains an Open Mouth Without Mouth Props	Yes
Patient Follows Directions	Yes, but more slowly
Degree of Amnesia	Moderate to complete
Effect on Pain	Pain reaction markedly reduced or eliminated
Effect on Fear	Eliminated
Appearance of Patient	Relaxed; euphoric; less aware of immediate surroundings and less concerned with activity around him/her

TABLE 2 - continued

CHARACTERISTICS	PATIENT REACTIONS
Subjective Reactions	May feel a warm wave suffuse entire body; humming, droning, or vibratory sensation; a feeling of headiness, lethargy or drowsiness; voice becomes "throaty"; a feeling of euphoria, safety; thoughts may wander beyond treatment room; less idea of lapse of time
Gag Reflex	Depressed

Note: Plane 2 is considered ideal for many apprehensive, anxious or fearful dental patients.

TABLE 4

THE PLANES OF ANALGESIA: PLANE 3

CHARACTERISTICS	PATIENT REACTIONS
Respiration	Maybe normal, irregular, superficial or prolonged
General Muscles	Usually normal; sometimes rigid mandible or rigid body
Eye	Very hard stare; angry or very sleepy look; eyes may close; eyeball may become eccentric; pupils may be dilated
Pulse Rate	Normal; may be accelerated
Blood Pressure	Normal
Patient Maintains an Open Mouth Without Mouth Props	No; mouth tends to close; may open if operator presses on lower lip; but immediately closes again
Patient Follows Directions	Most usually not
Degree of Amnesia	Complete
Effect on Pain	Pain reaction eliminated
Effect on Fear	A short exposure (1-2 minutes) to this plane is useful for controling extreme fear; longer exposure brings many patients into a state of fear and then excitement

TABLE 4 - continued

CHARACTERISTICS	PATIENT REACTIONS
Appearance of Patient	Begins to assume appearance of unconsciousness, totally unaware of surroundings; jaw may become rigid; body may stiffen
Subjective Reactions	May have hallucinatory dreams; experience fear, a feeling of falling, a fear of dying with inability to do anything about it

Note: Plane 3 is not recommended.

INDICATIONS AND CONTRAINDICATIONS FOR NITROUS OXIDE-OXYGEN INHALATION SEDATION

The primary reason for administration of N_2O-O_2 to dental patients is to reduce fear and anxiety. Even nonthreatening dental procedures can be traumatic for patients who experience dental fear. Dental office personnel have the responsibility of selecting appropriate cases for administration of nitrous oxide. An updated, thorough personal and health history must be completed for each patient prior to administration. Indications (reasons why N_2O-O_2 should be given) and contraindications (when N_2O-O_2 should be avoided) are discussed in this section.

Primary Indications

1. **Fear and Anxiety**

   Fearful or anxious patients will present patient management problems. They also are more prone to medical emergencies because stress can initiate an exacerbation of their medical problems. Patients who have a history of upsetting or painful experiences in the dental office may be more anxious. Nitrous oxide-oxygen sedation can serve to safely relax most fearful or anxious dental patients. Some persons, however, are not comfortable with the effects of N_2O and others will not achieve adequate sedation at safe concentrations. When adequate sedation cannot be achieved within safe limits, another form of sedative should be selected for that patient.

2. **Patient who refuses or is allergic to local anesthesia**

   Although N_2O-O_2 is not a true substitute for local anesthesia, it can be used to reduce pain sensation when local anesthesia is contraindicated.

3. **Prominent gag reflex**

   Gagging is a potential problem during many dental procedures. Administration of N_2O-O_2 will reduce or eliminate severe gagging without jeopardizing protective cough reflexes. Seating the patient in an upright position might also be helpful.

4. **Patient gets impatient at long appointments**

   Patients who are nervous or stressed sometimes become impatient at long appointments. Because nitrous oxide reduces the patient's awareness of the lapse of time, it can be beneficial in these cases. A clinician should, however, administer pure oxygen every 45 minutes to reduce the potential for adverse reactions associated with prolonged administration.

Indications with Special Consideration

In the recent past, N_2O-O_2 sedation has become increasingly important in management of medically compromised patients. It is particularly indicated when these patients are stressed or anxious because stress can result in an oxygen deficit or cause an acute exacerbation of an underlying medical problem. Nitrous oxide should only be administered to these patients with special consideration given to each case. It is critical to determine whether the medical condition is under treatment and control. If not, administration of N_2O is not recommended. A physician consultation is recommended prior to administering N_2O-O_2 sedation. As long as the following conditions are not severe, nitrous oxide is the sedative of choice because of its margin of safety and its adjunctive use of oxygen during administration.

1. Cardiovascular disease

N_2O-O_2 inhalation sedation can minimize the risk of myocardial infarction (heart attack) or angina pectoris (chest pain) resulting from stress during a dental appointment. It is the most appropriate technique for sedating patients with a history of cardiovascular disease. It is not recommended, however, within 6 to 9 months following a heart attack or when there is cardiac dysfunction.

2. Cerebrovascular disease

The patient who has cerebrovascular disease, or a history of a stroke, can receive N_2O-O_2 for stress/anxiety reduction. Levels beyond 50% are not recommended due to the threat of hypoxia.

3. Respiratory disease: asthma

Patients with bronchial asthma can receive nitrous oxide because it is nonirritating to the bronchial and pulmonary tissues. Increased stress can lead to an asthmatic attack; therefore, N_2O-O_2 sedation can be helpful. Refer to contraindications for respiratory diseases that prohibit the use of nitrous oxide.

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4. **Hepatic disease**

Hepatic (liver) disease, such as hepatitis or cirrhosis, often contraindicates administration of drugs because the agent is biotransformed in the liver. Since N_2O-O_2 is not biotransformed anywhere in the body, it can be used in patients with hepatic disease.

5. **Epilepsy and other seizure disorders**

Again, because stress might trigger the onset of a seizure, the use of N_2O-O_2 can be useful in these patients. It is important to avoid hypoxia; therefore, higher concentrations of N_2O must be avoided.

6. **Patients taking tranquilizers, analgesics, antidepressants or hypnotics**

Many of these drugs cause depression of the central nervous system; therefore, it is difficult to predict and control the pharmacological effects of nitrous oxide. All drugs taken by patients who are to receive nitrous oxide should be evaluated for effects on the CNS, or for contraindications with anesthetics. Some examples include tranquilizers (diazepam), analgesics (morphine, percodan, meperidine), and hypnotics (barbiturates). Nitrous oxide should not be used in conjunction with these drugs unless absolutely necessary. If used, N_2O should be administered in low concentrations.

7. **Patients using alcohol**

Nitrous oxide is not recommended for patients who are chronic alcohol abusers or for patients who may have had a social drink immediately prior to the dental appointment

8. **Allergies**

There are no known allergies to nitrous oxide.

Contraindications

In the following cases, administration of nitrous oxide is not recommended. A careful review of the health history should be made to rule out these contraindications.

1. **Nasal Obstruction**

Patients with nasal obstruction cannot sufficiently inhale the N_2O-O gases administered. Conditions which might lead to nasal blockage include:

a. the common cold

b. upper respiratory infections (URI) or bronchitis

c. allergies or hay fever

d. deviated nasal septum

In conditions such as the common cold, bronchitis or URI, the nasal hood will be contaminated during use. If nitrous oxide administration is attempted, a disposable nosepiece should be used or the nosepiece should be sterilized before cross-contamination of personnel or other patients can occur.

2. Chronic Obstructive Pulmonary Diseases (COPD)

COPD will prevent the sedative effect of N_20 and contraindicate its use. Patients with emphysema, tuberculosis, eustachian tube blockage and other chronic respiratory disorders should not receive nitrous oxide. It can result in immunosuppression, abnormal pulmonary function, secondary bacterial infections, or hypoxia.

3. Debilitating cardiac or cerebrovascular disease

If heart disease or valvular damage limits a person's daily activities, N_20 is not recommended. Patients who report cyanosis (blue coloring), dyspnea (shortness of breath), need for increased pillows when sleeping, or artery blockage should avoid all CNS depressants including N_20.

4. Pregnancy

Nitrous oxide does cross the placenta to the fetus and it affects the baby's CNS. Studies in animals show that a single dose of N_20 is usually safe when administered in proper concentrations. Nitrous oxide also has been shown to be the most highly recommended sedation agent when one must be employed during pregnancy, In the opinion of this author, however, administration of all drugs should be avoided whenever possible during pregnancy, and particularly during the first trimester. If a sedative is absolutely essential for dental treatment, a medical consultation should be made prior to administration.

5. Patients with psychiatric disorders or compulsive personalities

It is difficult to predict the effects of N_20-0_2 in patients with psychiatric disorders or compulsive personalities. Drugs given to psychiatric patients, such as mood-altering antidepressants, also should be carefully evaluated. Altering the consciousness of patients with psychiatric disorders or patients who fear "losing control" may result in negative reactions.

6. **Claustrophobic patients**

Some patients are not able to tolerate the nasal mask without a feeling of suffocation. The nasal cannula can be used in these cases; however, this technique is not routinely recommended because of the risk of exposure of trace elements to dental personnel.

7. **Children with severe behavioral problems**

Nitrous oxide can be used to control fear and anxiety in most pedodontic patients. A severely disruptive child, however, cannot give the degree of cooperation needed for administration of N_20-0_2 inhalation sedation. Forced administration is never recommended.

8. **The patient who does not want N_20-0_2**

Patients should never be forced or coerced to receive N_20 (or any other drug) against their will. Doing so can result in negative side effects or legal repercussions.

ARMAMENTARIUM

There are many types of inhalation sedation units. This module discusses the most common apparatus used. A brief review of the central storage system, the nitrous oxide-oxygen machine, the breathing apparatus and safety features follows.

The Central Storage System

The central storage system is where the large tanks of nitrous oxide and oxygen are stored. It is usually separated from the treatment rooms. As mentioned previously, the nitrous oxide tanks are always marked blue for identification, and the oxygen tanks are green. A Pin Index Safety System prevents attaching the wrong cylinder to the yokes during installation. Cylinders should be handled with care, stored upright and kept in tact.

A pressure gauge monitors the pressure within each cylinder. The nitrous oxide is stored at approximately 750 psig (pounds per square inch of gas) and the oxygen has approximately 1800-2150 psig. N_20 and 0_2 are stored as a liquid under pressure which is released as a gas.

Pressure regulators are usually mounted inside of a box frame. They act to reduce cylinder pressure to about 50 psig to be used in the system.

When turning on the tanks in the control storage system, it is important to open the valves slowly in a counter clockwise direction. No grease, oil, or lubricant of any type should be used on any of the valves, regulators, gauges, or tanks. It can be extremely dangerous if these lubricants come in contact with the gases because an explosion could result.

When the nitrous oxide and oxygen are turned on, the operator should check each pressure gauge and pressure regulator to be sure that the gases are flowing properly. Manufacturer's instructions should be read to ascertain proper readings.

Nitrous Oxide-Oxygen Machine

Several types of machines are available for use in nitrous oxide-oxygen inhalation sedation. The gases generally are transported to the machine at chairside through a series of copper tubings from the central storage area. Some offices have portable nitrous oxide-oxygen machines which house small tanks of N_20 and 0_2. The portable units usually are employed when nitrous oxide is administered infrequently.

The most common machine used in dentistry has ball-type flow meters which indicate the amount of gas being administered. The machine has an on-off knob which allows the gases to flow into the tubing and nasal mask. Two additional knobs are used to regulate the amount of nitrous oxide or oxygen flow which is displayed in two separate glass tubings. As each knob is turned to a more open position, more gas enters the glass tubing in the flow meter and a ball floats to indicate how much gas is being dispensed. The flow tubes have markings that are numbered to show how many liters per minute are being dispensed. These two "ball flow meters" (one for N_20 and one for 0_2) enable the clinician to regulate the flow up to a maximum of 10 liters per minute (L./min.). The nitrous oxide can be turned off to 0 L./min., but the minimum oxygen flow permitted is about 2.5-3 L./min. This safety feature prevents administration of pure nitrous oxide.

A reservoir bag, or breathing bag is located beneath the flowmeter. This bladder-type bag, made of rubber or silicone, holds a portion of the gas(es) that are available to be delivered into the flowmeter system. The main purpose of this bag is to store additional gas(es) in case the patient's respiratory demands exceed the amount being delivered through the flowmeter. During normal respiration, nitrous oxide and oxygen are delivered directly into the flowmeter and none is taken from the reservoir bag. It also expands and contracts when a patient breathes so that respiration can be monitored during administration of nitrous oxide.

Conducting tubes, or hoses, connect the nitrous oxide machine to the copper tubing leading to the central storage area. They also connect the machine to the nasal mask, or hood, used to administer nitrous oxide to the patient.

Breathing Apparatus

Three types of breathing apparatus can be used for inhalation sedation: the full face mask, the nasal hood, or the nasal cannula. The full face mask covers both the nose and the mouth, so it is impractical for use in dentistry. It is recommended, however, for administration of forced oxygen in cases of medical emergencies requiring oxygen for management. The nasal cannula is made of soft plastic tubing with two short prongs which fit into the nostrils for breathing. It is not recommended for routine use with nitrous oxide due to concerns about long-term exposure of dental personnel to trace elements of nitrous oxide in the operatory. Thus, a nasal hood is most frequently employed in dental practices.

The nasal hood fits comfortably, yet snugly, over the patient's nose. Two types are available. The traditional nosepiece has one hose on each side that is used for inhalation and exhaled gases are eliminated through an exhaling valve located on the top of the nasal hood. Again, this exhaling valve creates concerns for occupational exposure; thus, a scavenging nasal hood is recommended. The scavenging nasal hood typically has four tubes (two on each side) connected to it. Two of the tubes contain gas(es) flowing from the nitrous oxide machine. The other two tubes carry exhaled gases through a controlled ventilation system which deposits them outside of the building, or to a safe repository away from the dental operatory.

When selecting a nasal hood, the clinician should be sure that it fits the patient's nose properly in order to prevent discomfort, but to ensure minimal or no leakage into the treatment room. Autoclavable nasal hoods, or disposable hoods, are recommended in order to prevent disease transmission. Nasal hoods and tubing also should be checked frequently for cracks which might allow leakage and replaced as needed.

Safety Features

All inhalation sedation units marketed in the United States contain certain safety features to prevent accidents from occurring. They are designed so that a minimum of 21% oxygen will always be administered through the system. Any mechanical device can fail, however, so visual and verbal monitoring of a patient is always critical.

A brief description of these safety features follows:

1. Pin index and diameter index safety systems - make it virtually impossible to attach N_20 tanks to O_2 yokes and vice verse.

2. Minimum oxygen liter flow - assures that 2.5-3.0 L./min. of oxygen is the minimum amount that can be administered; thus a maximum of 75-79% nitrous oxide can be administered.

3. Oxygen fail-safe system - designed so that the nitrous oxide will automatically turn off when oxygen is depleted before the N_20 tank is empty.

4. Emergency air inlet - designed to remain closed as long as gas(es) are being administered to the patient; however, when the oxygen fail safe system turns gases off, room air is allowed to enter the system so that the patient can continue to breath through the nasal hood.

5. Fail-safe alarm - when the fail safe system turns off the gases, an audible alarm sounds to alert the clinician that the patient no longer is receiving N_20-0_2.

6. Oxygen flush button - this flush mechanism allows for 100% oxygen to be administered through the reservoir bag in the event of an emergency. For forced oxygen delivery, however, a full face mask is required.

7. Color coding - all parts (knobs, tanks, and sometimes tubing) are color-coded blue for N_20 and green for 0_2.

8. Texture of knobs - the knobs used to regulate liters of gas flowing into each tube are often textured differently to differentiate between adjusting the flow of N_20 and the flow of 0_2.

PROCEDURE FOR ADMINISTRATION OF NITROUS OXIDE

Prior to administration of nitrous oxide, the clinician must complete a thorough medical history review and record vital signs of the patient. The medical history should be reviewed thoroughly with all new patients and updated at each reappointment or recall appointment. Special consideration should be given to all indications and contraindications prior to the administration of nitrous oxide.

Vital signs also must be recorded for each new patient or recall patient. Three basic vital signs including pulse rate, blood pressure and respiration are indicated. The first measurement of each vital sign is recorded as the baseline for any particular patient. These baseline data will be used as that patient's normal and all future measurements will be compared to it to determine if any change has occurred. This comparison becomes particularly important in an emergency situation.

The measurement and recording of pulse, blood pressure and respiration is simple to complete. Instructions for each procedure follows.

Vital Signs

The pulse rate is obtained by placing the pads of two (or more) fingers over the radial artery which is located on the wrist, below the hand, on the same side as the thumb. The pulse should be obtained utilizing the index finger and middle finger since the thumb has a pulse of its own which might be confused with the patient's pulse. Feel around the designated area, applying gentle pressure until a beat can be detected. Once the pulse is located, begin counting the beats for a 60 second period. Record the pulse rate, (which is how many beats occur during the total 60 second period) and compare it to normal rates. In an adult patient, 60 to 100 beats/minute is considered normal; whereas in a child patient, 80-120 beats/minute is average. An anxious patient might have a higher pulse rate due to fear of dental procedures. If this is noted, wait 5 minutes and take the pulse again. It will usually subside during this resting period. An abnormal pulse rate should be drawn to the dentist's or physician's attention prior to proceeding with any dental treatment.

Next, the blood pressure is taken. Blood pressure measures how much air pressure is needed to close off an artery. A cuff is inflated on the upper arm until the blood going through the artery is stopped. This first measurement is called the "systolic" reading. The cuff is then slowly deflated until the artery is completely open and the blood flows freely through it. This second measurement is called the "diastolic" reading. It is the most important since it represents the constant pressure in the artery when the heart is beating at a normal rate and the artery is in its normal, open position.

Items needed for measuring the blood pressure include a sphygmomanometer and a stethoscope. The sphygmomanometer consists of a gauge, to measure air pressure in millimeters, connected by two hoses to an inflatable cuff. This cuff is wrapped around the patient's bare upper arm one inch above the bend of the elbow. The patient's arm should be resting on the arm of the dental chair. The positioned cuff should allow enough room for two fingers to be inserted between the cuff and the arm. The gauge should be positioned so that it is easily visible to the operator and the tubing should hang freely. A bulb is located at the end of the tubing. Turn the knob on the bulb until it is closed completely. Begin inflating the cuff by squeezing and releasing the bulb at the end of the tubing while palpating the radial artery (taking the pulse as previously described). Keep inflating the cuff until the pulse stops and continue inflating until the gauge rises 30 millimeters beyond that point. Then, begin deflating the cuff slowly by turning the knob counter clockwise until the pulse can be detected again. This level represents the approximate systolic reading. Be certain that the cuff is completely deflated before placing the stethoscope. This may require you to squeeze the cuff to force all of the air out. The two ear plugs on the stethoscope should be placed in the operator's ears. The round, flat portion of the stethoscope is centered in the bend of the arm just below the cuff. Close the knob on the bulb again. Inflate the cuff 30 mm above the previously determined approximate systolic reading. Deflate the cuff slowly while listening for changes in the pulse. At the point when pulse first appears, read the number on the gauge. This is the systolic pressure. Continue deflating the cuff slowly and listening until the pulse completely disappears. At this point, read the number on the gauge again. This is the diastolic pressure. The blood pressure is recorded as a fraction with the systolic reading over the diastolic reading. The patient's blood pressure should be compared to normal rates. Normal blood pressure is approximately 120/80 (or 120 systolic and 80 diastolic); however, systolic pressure less than 140 and diastolic pressure less than 90 is acceptable for an average adult patient. Clinical evaluation of blood pressure may lead to discovery of abnormal rates. The appropriate steps to follow with each reading are outlined in Table 4.

TABLE 4

CLINICAL EVALUATION OF BLOOD PRESSURE

BLOOD PRESSURE Systolic Diastolic	DENTAL THERAPY CONSIDERATIONS
less than 140 and less than 90	Routine dental management; recheck in six months.
140 to 160 and/or 90 to 95	Recheck blood pressure prior to dental therapy for three consecutive appointments. If all exceed these guidelines, medical consultation is indicated.
160 to 200 and/or 95 to 115	Recheck blood pressure in five minutes. If still elevated, medical consultation prior to dental therapy is indicated.
greater than 200 and/or greater than 115	Recheck blood pressure in five minutes. If still elevated, immediate medical consultation is indicated. No dental therapy.

Adapted from: Malamed, Stanley F. Medical Emergencies in the Dental Office.

The third routine vital sign to be recorded is the respiratory rate. This should be noted when the patient is unaware of observation; since it is often difficult for a patient to breath normally when being watched. Some operators choose to observe respiration immediately after taking pulse for 60 seconds, leaving their fingers over the radial artery so the patient is unaware of observation. Respirations are counted by observing the rise and fall of the patient's chest for 60 seconds. Normal respiratory rate for an adult is 16 to 18 breaths per minutes; whereas, a child will take 40 to 45 breaths per minute. Any significant variation in respiratory rate should be evaluated by the dentist prior to dental therapy. If within normal range, the respiratory rate is recorded with other vital signs and utilized as baseline data.

Any abnormality in medical history or vital signs should be drawn to the dentist's attention prior to proceeding with treatment. This is particularly important when nitrous oxide is going to be administered. If all signs are normal, the operator should note each consideration mentally, as well as on the chart, so that the information is readily available in the event of an emergency. Once this has been completed, nitrous oxide can be administered.

Preanesthetic Preparation

The first step to preparing for administration of nitrous oxide is turning on the main tanks containing nitrous oxide and oxygen. Tanks should always be turned on slowly to avoid a build-up of heat, and cylinders and gauges should be checked to be certain that both tanks are full. Procedure for this will vary, therefore, manufacturer's instructions should be read carefully prior to operating any equipment.

The patient is seated comfortably and, as discussed previously, medical history and vital signs are checked. The analgesic machine should be positioned behind the patient with controls readily visible and easily accessible to the operator. The appropriate size nosepiece is selected to fit snugly over the patient's nose without causing an inability to breath or leakage around the sides. The nosepiece should be cleaned with a cold sterilizing agent rather than alcohol, since alcohol dries out the rubber and causes it to crack.

Prior to administration of nitrous oxide, the operator should discuss the procedure with the patient. The number one rule is to **ALWAYS BE POSITIVE** when discussing techniques and effects with patients. Describe expected results in positive terms. Tell the patient that they will feel relaxed, warm and comfortable. Answer any questions they may have honestly; yet, do not use negative terminology. For example, a patient might ask, "Does this N_20 make you feel drunk or nauseous?" You can respond that "with proper administration, both of these side effects are rare; you should feel very relaxed." At the same time that you are honestly answering the question, you are also reassuring the patient. It is important that you review all of the clinical manifestations of each plane of analgesia at this time in order to become familiar with each one so that you are capable of answering questions for the patient.

Once the patient has been informed of all procedures and effects, consent to the administration of nitrous oxide can be obtained. If the patient agrees to proceed, administration of nitrous oxide is begun.

Techniques for Administration

The traditional nosepiece has an air valve in the center which should be opened about half way prior to placing the nosepiece on the patient's face. When using a scavenging mask, there is no valve that needs adjustment. Oxygen flow is begun at this time. the reason for completing these two procedures prior to placement of the nosepiece is to avoid causing a feeling of suffocation when covering the patient's nose. Be certain that the tubing from the machine to the nosepiece is not tangled to provide for a smooth, even flow of gases. Place the nosepiece over the patient's nose and ask him/her to breath normally while only oxygen is flowing in order to provide a period of adjustment to breathing out of the nosepiece.

At placement time, the oxygen is set at 8 liters. As mentioned earlier, the gauge on the nitrous oxide-oxygen machine will have numbers which represent liters of gaseous flow. Often lines between the numbers will indicate half liters. A small ball will rise and fall by turning the knob marked green for oxygen. Turn this knob until the ball reaches 8 liters on the gauge. After placing the nasal mask, ask the patient if this volume is comfortable for their respiration. It may need to be adjusted up or down for their needs (5-10 L./min.).

After the patient has had a few minutes to adjust to breathing normally, flow of nitrous oxide can be begun. Stress that the patient should continue to breath through the nose since mouthbreathing will cause an additional intake of oxygen from the room air, thereby, changing the ratio of gases. Patients can be informed that breathing through the mouth causes increased oxygen inhalation; therefore, they can regulate the effects of nitrous oxide by taking in room air if they feel that the nitrous oxide is a little stronger than desired. Request that they inform you if this should happen, so that you can adjust the flow of the gases accordingly. Talking will have the same effect as mouth breathing; therefore, patients should not talk to excess or the nitrous oxide will be diluted with room air. Observe the reservoir bag to be sure that the patient is breathing at a normal rate through the nose hood.

When the patient is breathing normally through the nosepiece, nitrous oxide flow can be started. At this time, the air valve on the nosepiece is closed slightly to prevent leakage of nitrous oxide into the room air. In the trituration techniques described in this module, the total flow of gas(es) will always remain constant. Thus, if the clinician begins with 8 lpm (liters per minute) the total amount of N20 and 02 administered will always equal 8 lpm. The first adjustment to begin N20 administration should equal about 20% N_2O and 80% O_2. Since 20% of 8 lpm is appropriately 1.5 lpm, the nitrous oxide would be started at 1.5 lpm and the oxygen would be reduced (from 8 lpm) to 6.5 lpm. Note that 1.5 l and 6.5 l equals the eight liters total flow with which the administration was started. Each time the nitrous oxide is increased 1/2 liter, the oxygen is decreased 1/2 liter. In this way, a total flow of 8 liters is maintained continuously. The oxygen is begun at 8 liters; 1 1/2 liter of nitrous oxide (N_2O) is administered and the oxygen (O_2) is decreased to 6 1/2 liters; therefore, a total of 8 liters is maintained. Wait one minute before adjusting these levels again observing the patient's reactions. Continue decreasing the oxygen by 1/2 liter followed by increasing the nitrous oxide by 1/2 liter and observing the patient's response (i.e., 6 liters O_2 and 2 liters N_2O then observe; 5 1/2 liters O_2 and 2 1/2 liters N_2O then observe; and so on). The last adjustment of N_2O should be made when the oxygen and the nitrous oxide are each at 4 liters, again totalling 8 liters. At this point, 50 percent O_2 and 50 percent N_2O are being administered. This is the highest ratio of nitrous oxide recommended for safe administration without special consideration. The importance of maintaining an appropriate ratio of oxygen to nitrous oxide cannot be over stressed. Remember that detrimental effects of nitrous oxide are caused by hypoxia. This is why oxygen is administered simultaneously with nitrous oxide.

In order to compute the ratio of oxygen to nitrous oxide, divide the total flow of combined gases (in this case 8 liters) into the liters of nitrous oxide being administered. For example, if your gauges are set at 5 liters O_2 and 3 liters N_2O, you would divide 8 (total liters) into 3 (N_2O liters) to find that .27 or 27 percent nitrous oxide was being administered. Next, subtract the percentage of nitrous oxide from 100 percent (total flow) to determine the percentage of oxygen being administered. In this example, 27 percent (N_2O) from 100 percent equals 73 percent oxygen. The ultimate ratio of nitrous oxide to oxygen should be recorded for each administration.

Remember, it takes one minute for any change in dosage to become evident. For this reason, the patient should be observed closely before readjusting the knobs. Carefully monitor the signs and symptoms of the patient. You can communicate with your patients to determine level of analgesia as long as they are not required to talk excessively, thereby inhaling too much room air. Be sure to use direct, specific questions while monitoring the patient. Ask "What are you feeling" rather than "How are you feeling?" Ask "are you breathing comfortably" or "do you feel warm and relaxed?" It is a good idea to tell patients you will use their name when speaking to them. Patients may drift in and out of the environment and should be able to relax. With these instructions, they will not feel forced to attempt to stay alert, listening to the operators. They will, however, be able to respond and cooperate when addressed by name.

Another suggestion is to inform the patient of the time frame occasionally, since time is often distorted under the effects of nitrous oxide. Tell the patient how long they have been there in relation to time remaining. For example, you might say, "you have been here for 20 minutes and we are about half-way through your treatment."

When the patient reaches the appropriate level (generally, plane two of analgesia), the dental treatment planned can be begun. The patient will feel relaxed and comfortable; and may feel drowsy and warm; or may drift in and out of the environment, but will still be able to cooperate. Clinical signs and symptoms should continue to be monitored closely for any change so further adjustments can be made if necessary.

If patients become irritated or they can no longer cooperate and their mouth tends to close, plane three is being approached. This is an indication that the nitrous oxide level is too high. Also, changes in physical symptoms, such as dilation of pupils or nausea, would be an indication of too much nitrous oxide. At this point the clinician should take three steps to rectify the situation:

1. reduce the level of nitrous oxide or turn it off depending upon severity of the side effect or reaction;
2. increase the level of oxygen; and
3. reassure the patient.

All models of nitrous oxide-oxygen analgesia machines have a device called an oxygen "flush valve". When turned on, the breathing bag fills with oxygen rapidly at a flow of about 50 liters per minute. Any time that pure oxygen is needed quickly, the flush mechanism can be employed. This may become important in an emergency situation.

Since emergencies occur without notice and analgesia levels fluctuate, it is important to monitor the patient continuously while nitrous oxide is being administered. **NEVER** leave a patient unattended while under the effects of nitrous oxide. Some references suggest retaking vital signs during dental treatment to compare with baseline data. Remember, vital signs will remain normal with proper levels of analgesia. The ratio of oxygen to nitrous oxide should be maintained at a comfortable level according to the patient's response. Table 5 presents a few common clinical findings with appropriate procedures to follow in each.

TABLE 5

CLINICAL FINDINGS DURING MAINTENANCE PERIOD AND APPROPRIATE PROCEDURES TO FOLLOW

	CLINICAL FINDINGS	PROCEDURE TO FOLLOW
1.	Reduced activity of the eyes (either closed or comfortably fixed toward ceiling).	Means good sedation. No changes needed.
2.	Increased activity of the eyes.	Usually too light. Best to ascertain status by direct questioning. Probably needs positive verbal support and an increased N_2O-O_2 ratio.
3.	Fixed, hard stare of the eyes (possibly with dilation of pupils).	Too deep; approaching excitation stage. Reduce N_2O to O_2 ratio. Supply verbal and physical contact.
4.	Arms and legs crossed.	Patient is not relaxed yet. Needs more N_2O and suggestions designed to achieve relaxation. ("As you feel your arms becoming more and more relaxed let them rest naturally and comfortably by your side, and as you feel your legs becoming more and more relaxed, let them uncross and rest naturally and comfortably.")
5.	Patient talks too much.	Too light due to mouthbreathing. Place rubber dam or cotton rolls and holder. Be aware of too much N_2O when patient finally stops talking. May bring on sedation frighteningly fast.
6.	Patient answers rapidly.	Too light. May need to improve fit of nosepiece to prevent dilation with air or increase N_2O or both.

TABLE 5 - continued

CLINICAL FINDINGS	PROCEDURE TO FOLLOW
7. Patient answers slowly and deliberately.	Good sedation. No changes needed.
8. Patient does not answer.	May be: 1) tired and asleep, or 2) too deep. If no premedication was used and ratio of gases is such that anesthesia could not be produced (i.e., 30% N_2O), either no change or reduced N_2O. If in doubt, arouse patient by physically prodding and check verbally.
9. Perspiration appears on face.	Indicates onset of peripheral vasodilation. No change in ratio of gases needed. Reassure patient that this is expected and will pass. Remove outer garments for use after the appointment and cover with light blanket to reduce rate of evaporation and loss of body heat.
10. Paraesthesia (numbness or tingling) of extremities.	Indicates early phase of Stage 1 and is closely related to peripheral vasodilation phenomenon. Reassure patient that this is "just as it should be". If no other changes occur in one or two minutes, increase ratio of N_2O to O_2 to achieve plane two.
11. Paraesthesia (numbness or tingling) of lips, tongue or oral tissues.	Indicates more profound depth, probably achieving analgesia, and permits injections of local anesthetic to be given comfortably. After the injections, the N_2O may be reduced or turned off unless needed to control apprehension.

Adapted from: Langa, Harry, D.D.S. Relative Analgesia in Dental Practice.

After dental treatment is completed, pure oxygen is administered to stabilize the patient before dismissal. Turn the nitrous oxide completely off and increase the oxygen to 8 liters to "oxygenate" or "flush" the patient with oxygen. Pure oxygen should be administered for a minimum of 3 to 5 minutes following nitrous oxide analgesia. Oxygen should be administered until the patient regains "normalcy". It may take longer for some patients to return to normal than others. When oxygenating the patient, inform him/her that you are turning off the nitrous oxide and that, while breathing pure oxygen, the symptoms will disappear. An estimated 38 percent of the effects of nitrous oxide are psychological.

Once the patient feels normal again, vital signs should be taken again and compared to the baseline data. An operator who releases a patient who has not regained normalcy can be held legally liable for any harm that results. For this reason, oxygenation is essential. Also, if a patient is permitted to breath room air immediately after inhalation of nitrous oxide-oxygen, "diffusion anoxia" can result. If the patient is adequately flushed with oxygen, this condition can be prevented. Once the patient is oxygenated and reports that he/she feels normal, the patient can be dismissed. Some sources suggest administering a connect-the-dots test to patients to test their coordination prior to dismissal. After the patient is dismissed, a legal chart entry should be recorded.

Legal Chart Entries and Other Legal Considerations

There are two major reasons for being certain to record administration of nitrous oxide completely and accurately. First, in the event of a complaint by the patient or a malpractice suit, the dental chart will be considered a primary source of evidence. Second, dosage levels vary from patient to patient and even with the same patient on a day to day basis. Factors contributing to the variance include: amount of food or drink consumed prior to the appointment; mental and/or emotional state of the patient at any specific point in time; amount of sleep or physical condition of the patient; and increased tolerance with repeated administration. This is why the trituration technique presented in this module suggests beginning with pure oxygen and increasing nitrous oxide slowly at each patient appointment. It is not safe to assume that the previous analgesic level will be appropriate on sequential visits. A very rapid induction also might cause nausea or other adverse reactions.

A complete and accurate chart recording includes the following information:

1. patient's vital signs (pre and post-op);

2. consent of the patient was granted;

3. routine information including date, procedure performed, and information given to the patient;

4. maximum levels of nitrous oxide and oxygen stated in terms of percentages of each gas administered and total volume used;

5. length of administration;

6. any other anesthetics, premedication, or post medication administered;

7. length of oxygenation and patient's report of feeling normal prior to dismissal;

8. any side effects or complications incurred, or the fact that none occurred.

A sample chart entry follows:

> 9/15/90 MH reviewed; pulse 75, PB 125/82, resp. 16; consent for N_2O obtained; 73% O_2, 27% N_2O for 20 min.; 3% Carboncaine 1.2 ml inf. alv.; amalgam #30 MOD; 8 liter O_2 for 5 min. until patient reported normalcy; no complications, post-op vital 70, 120/80, 16.

Additional considerations necessary for the ethical and legal administration of nitrous oxide should be made. Emergency equipment must be readily available at all times. Be certain to follow all previously discussed precautionary measures including: taking a thorough medical history including vital signs; making sure that the patient has regained normalcy prior to dismissal; obtaining consent of the patient before administration of nitrous oxide; documenting procedures thoroughly.

It is essential that any clinicians involved in the administration of nitrous oxide complete specific training prior to use. This is important for safety of the patient as well as legal protection for the operator. The dentist, dental hygienist and/or assistant can be held liable in any civil or malpractice suits filed by the patient.

Idaho State Board of Dentistry Rules and Regulations state that dental assistants who have completed training and obtained certification can "aid in the administration of nitrous oxide." This rule has been interpreted to mean that dental assistants can monitor the patient and adjust levels of nitrous oxide to lower concentrations after nitrous oxide-oxygen analgesia has been administered by a licensed dentist. Dental assistants are not certified to legally administer nitrous oxide to patients or to begin induction.

A related consideration is liability insurance. Prior to utilizing nitrous oxide in the dental office, the liability policy must be cleared with the insurance carrier. Cost might be increased by a minimal amount; however, the increased cost is balanced by increased ability in patient management.

This completes instruction in the procedure for administration of nitrous oxide. Since the discussion presented was lengthy including explanations and justifications for each step, Table 6 presents a summary of steps to follow. Be certain to become totally familiar with the procedure prior to continuing.

TABLE 6

SUMMARY OF STEPS IN THE PROCEDURE FOR ADMINISTRATION OF N_2O

PROCEDURAL STAGE	STEPS INVOLVED
Preanesthetic Preparation	1. Have patient visit the restroom. 2. Check all equipment. 3. Turn on main tanks and analgesic machine. 4. Review medical history and take vital signs. 5. Explain procedure and effects to patient and obtain consent. 6. Select appropriate size nosepiece and clean with cold sterilizing agent.
During Administration	1. Open air valve in nosepiece. 2. Begin flow of O_2 at 8 liters. 3. Place nosepiece over patient's nose allowing breathing adjustment time. 4. Slightly close air valve in nosepiece. 5. Begin N_2O at 20% concentration (1.5 lpm) and 02 at 80% 6.51 lpm). 6. Observe patient for one minute prior to changing dosage. 7. Increase N_2O by 1/2 liter and decrease O_2 by 1/2 liter until desired effect is obtained. 8. Monitor clinical manifestations closely adjusting levels as needed after waiting one minute. 9. Oxygenate patient until normalcy is regained (minimum 3 to 5 minutes).
Legal Chart Entry and Considerations	1. Record a complete and accurate legal entry. 2. Have emergency equipment readily available. 3. Complete proper training prior to administration. 4. Check with liability insurance carrier.

CONTROVERSY IN LITERATURE RELEVANT TO NITROUS OXIDE

Many references state that nitrous oxide is the safest of all anesthetic gases. Some literature states that there is no harm associated with nitrous oxide at all. There are also many studies which show detrimental effects due to nitrous oxide. Problems with these studies leave some question relevant to their validity. Often nitrous oxide is not isolated for study. It is tested in operating rooms where other anesthetic gases are employed simultaneously. Most results from studies which do isolate nitrous oxide have consisted of laboratory investigations on animals. Finally, extremely high levels and prolonged administration have been utilized for testing purposes.

Levels and length of administration seem to contribute to a significant difference in results. The lower level of nitrous oxide employed and less prolonged administrations have shown lesser or no detrimental side effects. In addition, nitrous oxide has been shown to exhibit addictive properties and to increase susceptibility to suggestion. Literature has documented some detrimental effects related to occupational exposure to trace amounts of nitrous oxide.

Occupational Exposure

Trace amounts of gases unavoidably leak into room air during utilization of nitrous oxide. With chronic exposure, such as dental personnel receive during daily administrations to patients, nitrous oxide is potentially toxic. Sources of leakage include: the nitrous machine itself, hoses, the nasal mask or nosepiece, and the patient's mouth. Possible detrimental effects to dental personnel include: increased kidney and liver diseases, increased spontaneous abortion (miscarriage), increased cancer and decreased bone marrow. The incidence seems to be greater in females than males.

Preventive measures should be taken in the dental office to minimize exposure. Primary control measures include:

1. Testing equipment for leakage and providing preventive maintenance 4 times/year.

2. Low leakage techniques

    a. proper fitting nosepiece;
    b. closed air value on nosepiece or preferably use of scavenging nose hood;
    c. minimize patient conversation.

3. Manufactured devices for collection and disposal of gases
    a. scavenging masks;
    b. outdoor ventilation system.
4. Air monitoring program.

Your dental supply representative can be consulted regarding specifications and cost involved in this protective equipment. The more frequently nitrous oxide is administered in a particular dental practice, the more essential these items become.

A bibliography is provided for further information relevant to all topics included in this module. To complete your instruction in the administration of nitrous oxide, answer all questions on the self-examination that follows.

SELF-EXAMINATION

AIDING IN THE ADMINISTRATION OF N2O

Directions: Answer the following questions on a separate piece of paper to the best of your ability. You may use the module to look up needed information. Upon completion of the exam, review all responses to familiarize yourself with pertinent information.

1. What portion/functions of the CNS and ANS are affected by nitrous oxide?

2. How does oxygen travel through the respiratory system?

3. What changes in respiration/breathing are described by the following terms?

    a. bradypnea
    b. tachypnea
    c. hyperpnea
    d. hypopnea
    e. eupnea
    f. anoxia
    g. hypoxia

4. How does nitrous oxide travel through the respiratory system?

5. What effect does N_2O have on CNS and ANS?

6. What are possible side effects and adverse reactions of nitrous oxide and how can these be prevented?

7. What is the difference between anesthesia and analgesia?

8. What are the four stages of anesthesia and what reactions will a patient have in each stage?

9. What are the clinical manifestations observed in each plane of analgesia?

10. How can a clinician recognize that a patient is in deep plane two, approaching plane three of analgesia? What should be done when these signs and symptoms occur?

11. How are a patient's respiration, blood pressure, pulse and pupils affected by the administration of nitrous oxide when in plane two of analgesia and when in plane three of analgesia or light anesthesia?

12. When is the administration of nitrous oxide indicated for dental treatment?

13. When is the administration of nitrous oxide contraindicated for dental treatment?

14. Why are vital signs recorded prior to the administration of N_2O?

15. How is the pulse rate obtained?

16. What are normal pulse rates for an adult patient and a child patient?

17. How is blood pressure taken (describe the procedure in detail)?

18. What is the normal blood pressure range for an adult patient?

19. What alterations in dental treatment should be made when the patient's blood pressure is 140 to 160 systolic and/or 90 to 95 diastolic; 160 to 200 systolic and/or 95 to 115 diastolic; and greater than 200 systolic and/or greater than 155 diastolic?

20. How is the respiratory rate observed?

21. What are the normal respiratory rates for an adult patient and a child patient?

22. What should a dental professional do when a significant abnormality in vital sign(s) is noted?

23. What steps are taken during preanesthetic preparation?

24. What is a fail-safe system?

25. How should a clinician explain the procedures and effects of nitrous oxide to a patient who is going to receive it?

26. What steps are followed during the administration of nitrous oxide?

27. How is the ratio (percentage) of oxygen to nitrous oxide computed if 6 liters of O_2 and 2 liters of N_2O are administered?

28. What is the maximum ratio of O_2 to N_2O that is recommended for administration during routine dental therapy?

29. What procedures are instituted if a patient is receiving too much N_2O?

30. How and why is a patient oxygenated prior to dismissal?

31. Why is a complete and accurate legal chart entry essential following nitrous oxide administration?

32. What points should be recorded in a complete and accurate legal chart entry following administration of nitrous oxide?

33. How does the Idaho State Board of Dentistry define "aiding in the administration" of nitrous oxide?

34. What are some of the variables which have had an effect on nitrous oxide research?

35. What preventive measures should be taken in the dental office to minimize occupational exposure to nitrous oxide?

BIBLIOGRAPHY

Selected Texts

Malamed, S.F. Sedation: A Guide to Patient Management. C.V. Mosby Co., St. Louis, 1985.

Malamed, S.F. Handbook of Medical Emergencies in Dental Practice. C.V. Mosby Co., St. Louis, 1989.

Bennett, C.R. Conscious Sedation in Dental Practice. C.V. Mosby Co., St. Louis, 1978.

Langa, H. Relative Analgesia in Dental Practice. W. B. Saunders Co., Philadelphia, 1976.

Selected Articles

Henry, R.J. and Quock, R.M. "Cardiovascular influences of nitrous oxide in spontaneously hypertensive rats." Anesth. Prog., 36(3):88-92, 1989.

Becker, D.E. "The respiratory effects of drugs used for conscious sedation and general anesthesia." JADA, 119:153-6, July 1989.

Jastak, J.T. "Issues of pain and anxiety control training and continuing education." J. Dent. Educ., 53 (5/6):293-6, 1989.

"Dental Phobia: Conquering fear with trust." JADA, 119:593-8, Nov. 1989.

Weinstein, P., et al. "The use of nitrous oxide in the treatment of children: results of a controlled study." JADA, 112:325-331, March 1986.

"Conscious Sedation: Benefits and risks." JADA, 109:546-557, Oct. 1984.

Duncan, G.H. and Moore, P. "Nitrous oxide and the dental patient: a review of adverse reactions." JADA, 108:213-9, Feb. 1984.

Module 5-B

AIDING IN THE ADMINISTRATION
OF
NITROUS OXIDE-OXYGEN ANALGESIA

Final Examination

Name______________________ Date______

Grade______

AIDING IN THE ADMINISTRATION OF NITROUS OXIDE/OXYGEN ANALGESIA

FINAL EXAMINATION

Directions: Answer the following multiple choice questions by circling the one letter representing the most correct answer.

1. How does nitrous oxide travel through the blood stream?

   a. attached to hemoglobin
   b. in a free gas state
   c. by a chemical bond
   d. attached to red blood cells

2. Which of the following statements defines the term "hypoxia"?

   a. underrespiration
   b. slow breathing
   c. normal breathing
   d. decreased oxygen in tissue
   e. increased oxygen in tissue

3. How is nitrous oxide classified when considering all of its properties?

   a. anesthetic
   b. analgesic
   c. sedative
   d. a and b
   e. none of the above

4. Which of the following side effects can occur with administration of nitrous oxide/oxygen at analgesic levels?

   1. bone marrow depression
   2. hallucinations
   3. brain damage
   4. loss of protective reflexes
   5. nausea

   Answer: a. 1, 2 and 3
   b. 1, 2 and 5
   c. 2, 3 and 4
   d. 2, 4 and 5
   e. all of the above

5. Which of the following reactions would indicate that a patient is being maintained at the appropriate level of relative analgesia?

   a. the patient giggles
   b. the patient's voice sounds "throaty"
   c. the patient is totally unaware of surroundings
   d. the patient's pupils are dilated
   e. the patient feels a slight tingling in fingers and toes

6. Which of the following reactions would indicate that a patient is in deep plane two of analgesia (indicating overly profound depth)?

   a. the patient's voice sounds "throaty"
   b. the patient's mouth tends to close frequently
   c. the patient has a dreamy look
   d. the patient drifts in and out of environment

7. How are the patient's vital signs affected by administration of nitrous oxide at the appropriate level of relative analgesia?

   a. pulse, respiration and blood pressure remain unchanged, within normal range
   b. pulse is accelerated; respiration and blood pressure remain unchanged
   c. pulse, respiration and blood pressure are all slowed
   d. blood pressure is reduced; pulse and respiration remain unchanged

8. Which of the following conditions would contraindicate administration of nitrous oxide?

   1. anxiety
   2. gagging reflex
   3. chronic obstructive pulmonary disease
   4. hypertension or cardiovascular disease
   5. psychiatric disorders

   Answer:
   a. 2, 3 and 4
   b. 1, 2 and 5
   c. 3, 4 and 5
   d. 3 and 5
   e. all of the above

9. What is the normal pulse rate for an adult patient?

   a. 80-120 beats/minute
   b. 60-100 beats/minute
   c. 40-80 beats/minute
   d. 100-140 beats/minute

10. What is the normal blood pressure range for an adult patient?

   a. $\frac{\text{less than 120}}{\text{less than 80}}$ and

   b. $\frac{\text{less than 140}}{\text{lessthan 90}}$ and

   c. $\frac{\text{140 to 160}}{\text{90 to 95}}$ and/or

   d. $\frac{\text{160 to 200}}{\text{95 to 115}}$ and/or

11. What safety measures are important when administering nitrous oxide?

    a. an alarm sounds if the equipment is malfunctioning
    b. a minimum of 2.5 to 3 liters of oxygen flows from the machine at all times
    c. the nitrous oxide will immediately turn itself off if oxygen runs out
    d. all of the above

12. What is the maximum percentage of nitrous oxide that is recommended for administration (with oxygen) to a dental patient?

    a. 25%
    b. 50%
    c. 75%
    d. 90%

13. If a patient becomes irritated or he/she can no longer cooperate during dental treatment with nitrous oxide, what should be done to rectify the situation?

    a. reduce the level of nitrous oxide
    b. increase the level of oxygen
    c. reassure the patient
    d. all of the above

14. How should a patient be oxygenated prior to dismissal to insure return to normalcy after a nitrous oxide administration?

    a. remove the nosepiece and allow the patient to breath room air for 3-5 minutes
    b. administer low levels of nitrous oxide toward the end of the appointment
    c. administer pure oxygen for 3-5 minutes
    d. allow the patient to sit in the waiting room until he/she feels normal

15. Which of the following legal considerations are necessary when nitrous oxide is employed during dental patient therapy?

    1. a complete and accurate chart entry
    2. obtaining consent of the patient
    3. readily available emergency equipment
    4. taking a thorough medical history including vital signs
    5. completing proper training prior to administering nitrous oxide

    Answer: a. 1, 2 and 3
    b. 2, 3 and 4
    c. 1, 3, 4 and 5
    d. all of the above

16. A patient comes to the office for root planing and curettage. The hygienist is performing these procedures and monitoring the nitrous oxide which has been administered. After these procedures are completed, the dental assistant is asked to stay with the patient until a state of normalcy is reached. The patient is dismissed and has a car accident one block from the office. Who could possibly be held liable if a suit were filed?

a. the dentist only
b. the dental hygienist only
c. the dental assistant only
d. the hygienist and assistant
e. the dentist, hygienist and assistant

17. How should a clinician explain the procedures and effects of nitrous oxide to a patient prior to administration?

a. warn patient of possible adverse reactions
b. assure patient that it is totally safe
c. tell patient that he/she might feel intoxicated or "high"
d. discuss techniques and effects in a positive manner
e. all of the above

18. If a patient is talking frequently during dental treatment with nitrous oxide, what can be expected?

a. analgesia will be too light
b. analgesia will be too deep
c. analgesia will not be affected

19. What color is utilized on all nitrous oxide tanks and equipment?

a. green
b. blue
c. red
d. no specific color

20. If 3 liters of nitrous oxide and 5 liters of oxygen are being administered to a patient, what is the percentage of nitrous oxyde?

a. 25%
b. 37%
c. 50%
d. 63%

True/False: **Answer the following items by circling T for correct statements or F for incorrect statements.**

T F 1. Nitrous Oxide equipment should be tested for leakage at least four times a year.

T F 2. Patients with psychological problems should receive nitrous oxide to calm them during dental procedures.

T F 3. Children should only receive nitrous oxide in rare situations.

T F 4. A patient may drift in and out of the environment when the proper level of nitrous oxide is being administered.

T F 5. Nitrous oxide should not be administered to epileptic patients.

AIDING IN THE ADMINISTRATION OF
NITROUS OXIDE/OXYGEN ANALGESIA

GRADING FOR FINAL EXAMINATION

In order to successfuly complete the Aiding in the Administration of Nitrous Oxide/Oxygen course, students must pass the final examination with a grade of 75% or higher. The following calculations are provided to the course instructor for determining examination grades. Multiple choice questions (#1-20) are two points each and true/false questions are one point each. Total points possible are 45.

Score	Percentage
45	100%
44	98%
43	96%
42	93%
41	91%
40	89%
39	87%
38	84%
37	82%
36	80%
35	78%
34	76%
33 or below	Below 75% - not passing

KEY FOR NITROUS OXIDE/OXYGEN
FINAL EXAMINATION

Multiple Choice: 2 points each

1. B
2. D
3. A
4. B
5. B
6. B
7. A
8. D
9. A
10. A
11. D
12. B
13. D
14. C
15. D
16. E
17. D
18. A
19. B
20. B

True/False : 1 point each

1. T
2. F
3. F
4. T
5. F

Module 6

TAKING ALGINATE IMPRESSIONS

Module 6-A

TAKING ALGINATE IMPRESSIONS FOR STUDY CASTS

Instructor/Student Module

TAKING ALGINATE IMPRESSIONS FOR STUDY CASTS
A Self-Study Module

developed by
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June, 1991

Adopted by
Idaho State Board for Vocational Education
650 West State Street
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INTRODUCTION

The taking of alginate impressions for study casts is recognized as a legal procedure for Idaho dental assistants to perform under the direct supervision of a dentist. Assistants must first successfully complete coursework approved by the Idaho State Board of Dentistry. A certificate or diploma of course completion as issued by the teaching institution will be the assistant's verification of compliance with Board standards. This module was designed to be utilized by Board-approved teaching entities. It offers basic information on the taking of alginate impressions which is intended to be supplemented with formal classroom, laboratory and clinical instruction.

The original module, Alginate Impressions and Diagnostic Casts, was produced by Quercus Corporation in 1978 with the assistance of the U.S. Department of Health, Education and Welfare (HEW Contract No. 299-74-0016) . The original module is no longer in print. Much of the information in this module has been taken from the 1978 version and has been updated to include more recent developments on this topic.

COURSE DESCRIPTION

Taking Alginate Impressions for Study Casts

Clock Hours

Lecture/Demonstration:	2 hours
Laboratory/Clinical:	5-1/2 hours
Written Examination:	30 minutes
Final Practical Examination:	Offered in conjunction with other expanded function exams at completion of 40-hour curriculum.

Course Description

The primary goal of this course is to provide the dental assistant with the background knowledge and clinical experience in taking acceptable alginate impressions for study casts. Upon completion of this course, the student will receive a certificate of compeletion/recognition indicating competency in performing this procedure.

Required Text

Taking Alginate Impressions for Study Casts, a self-study module developed by Carole R. Christie, CDA, M. Coun., Idaho State University, 1991. The original module, Alginate Impressions and Diagnostic Casts, was produced by Quercus Corporation in 1978 with the assistance of the U.S. Department of Health, Education and Welfare (HEW Contract No. 299-70016).

Course Requirements

For successful completion of the course, each participant must complete the following requirements:

1. Attend all class and clinic sessions;
2. Take 4 sets of acceptable alginate impressions;
   (a minimum score of 86% must be reached on each set of impressions to be considered acceptable).

NOTE: Impressions may be taken on other students. However, to assure exposure to a variety of patients, they may only be taken on a given student once.

3. Achieve a minimum of 75% on the written examination;
4. Successfully complete the final practical examination to receive a certification of completion/recognition to perform this function.
5. Materials to be supplied by the student:

a. rubber mixing bowl
b. alginate spatula
c. assorted sizes of alginate trays
d. alginate
e. powder/water measuring devices
f. utility wax strips
g. bite registration wax
h. manufacturer's recommened disinfecting agent for impressions and wax bite

Evaluation/Grading

This course is designed on a Pass/Fail basis. In order for the student to pass the course, the requirements listed on page 2 must be successfully completed. As previously stated, the minimum percentage for acceptable impressions is 86% and minimum of 75% must be achieved on the written examination. A description for determining the percentage scores is presented below.

A. Calculating Percentages for Alginate Impressions

Refer to the attached evaluation form on page 6 (it is the same as the evaluation form at the end of the module). Each criteria is evaluated as follows:

C = Criterion met = 2 points
I = Improvable = 1 point
X= Not Improvable = 0 points

Since there are 13 criteria (including the placement of a tongue space) for the mandibular impression and 9 criteria for the maxillary impression, each worth a maximum of 2 points, there are 44 total points possible for each set of impressions. A percentage score can then be calculated by adding the total number of points earned and dividing by the total points possible (44).

To facilitate calculations, the following evaluation scale is provided:

Points Achieved	Percentage
44	100
43	98
42	95
41	93
40	91
39	89
38	86 Proficiency Level
37	84
36	82
35	79
34	77
33	75
32	73
31	70

B. Calculating Percentages for Written Examination

For each wrong answer on the written examination, subtract 5 points from 100 to determine final score.

Procedure

1. Read the self-study module, Taking Alginate Impressions for Study Casts.
2. Answer objectives listed on page 8 .
3. Answer study questions on page 35 of the module.
4. For supplementary reading, refer to the reference list on page 38 of the module.

COURSE SCHEDULE

Clock Hours	Method of Instruction	Assigned Topic/Activity	Readings
2	Lecture/ Demonstration	Introduction to Course	Self-study module, pp. 1-40
		Purpose of Alginate Impressons	
		Physical Properties of Alginate	
		Composition of Alginate	
		Packaging of Alginate	
		Mixing of Alginate	
		Setting Time of Alginate	
		Dimensional Stability	
		Advantages of Alginate	
		Types of Trays	
		Tray Selection	
		Tray Modifications	
		Tray Sterilization	
		Disinfection of Impression	
		Storage of Alginate	
		Labeling of the Impression	
		Gagging Patient-Variation in Technique	
		Tongue Space of the Mandibular Impression	
		Alginate Impression Procedure	
		Defects in Impression and Possible Causes	
	Videotape	View videotape	
		Taking Alginate Impressions for Study Casts	
5 1/2	Laboratory/Clinical	Students practice taking impressions on one another to complete course requirements. (4 acceptable impressions, all on different patients) *Refer to Course Requirements	
30 Minutes	Written Examination	A comprehensive written exam consisting of multiple choice and/or true/false questions.	

TAKING ALGINATE IMPRESSIONS FOR STUDY CASTS
EVALUATION FORM

Clinician________________________ Patient____________________

Date___________________________ Instructor___________________

Key: C = Criterion Met = 2

I = Criterion Improvable = 1

X = Unacceptable = 0

* = Critical task; if a 2 is not achieved on a critical task, the process evaluation is unsatisfactory and must be redone.

	SELF			*INSTRUCTOR*		
TASK	**C**	**I**	**X**	**C**	**I**	**X**
MANDIBULAR						
1. All detail is reproduced, including the complete peripheral turn and a portion of the retromolar pads.	2	1	0	2	1	0
2. The detail is sharp, not blurred or indistinct.	2	1	0	2	1	0
3. Impression is free of voids in critical areas	2	1	0	2	1	0
4. Impressions is free of large folds of alginate	2	1	0	2	1	0
5. There are no areas where the alginate has pulled away from the tray.	2	1	0	2	1	0
6. Impression is free of bulges or depressions that indicate a subsurface bubble.	2	1	0	2	1	0
7. Impression is free of rips and tears, except in interproximal areas.	2	1	0	2	1	0
8. Alginate thoroughly covers the tray (no tray is visible through the alginate).	2	1	0	2	1	0
9. The alginate is smooth, not sponge-like	2	1	0	2	1	0

________/18

________%

For tongue space on the mandibular arch:

1. The surface is smooth.	2	1	0	2	1	0
2. The addition does not overlie the impression.	2	1	0	2	1	0
3. The addition is generally flat.	2	1	0	2	1	0
4. The addition is long enough to include the retromolar pads.	2	1	0	2	1	0

________/8
________%

MAXILLARY

1. All detail is reproduced, including the complete peripheral turn, the maxillary tuberosities, palatal arch.	2	1	0	2	1	0
2. The detail is sharp, not blurred or indistinct.	2	1	0	2	1	0
3. Impression is free of voids in critical areas.	2	1	0	2	1	0
4. Impression is free of large folds of alginate.	2	1	0	2	1	0
5. There are no areas where the alginate has pulled away from the tray.	2	1	0	2	1	0
6. Impression is free of rips and tears, except in interproximal areas.	2	1	0	2	1	0
7. Alginate thoroughly covers the tray (no tray is visible through the alginate).	2	1	0	2	1	0
8. Impression is free of bulges or depressions that indicate subsurface bubble.	2	1	0	2	1	0
9. The alginate is smooth, not sponge-like.	2	1	0	2	1	0

________/18
________%

Objectives

Following completion of lecture and laboratory/clinical activities the student will be able to:

1. Describe the physical properties important to manipulation of alginate impression materials.

2. Describe and demonstrate proper technique for taking alginate impressions, including: tray selection, patient instructions, mixing the alginate, loading the tray, seating the tray, removing the tray, rinsing and storing of impression.

3. Evaluate alginate impressions according to stated criteria.

4. Identify the cause of errors in technique and give solutions for the problem.

5. Describe and demonstrate appropriate aseptic technique for taking alginate impressions.

6. Describe the technique for disinfecting the impressions and wax registration.

Background Information

A recurring requirement in the dental office is for study models or diagnostic casts of patients' teeth and adjacent tissues. Various requirements necessitate these models, the most common being for diagnostic purposes. Models are also required in fabricating crowns and dies for prosthodontic appliances.

A diagnostic cast is an accurate replication of the anatomic form of the maxillary or mandibular dental arch showing the relationships of the remaining teeth and the surrounding soft tissues (Figure 1). Diagnostic casts are a supplement to the oral examination, but in some ways they can reveal more. They permit inspection from perspectives that are impossible to obtain when looking in the patient's mouth--the occlusion from the lingual view, for example. They also permit extended observations and comparsions far beyond the patient's endurance for holding his mouth open and are, of course, available for study during the patient's absence. The dentist forms a treatment plan based on the oral examination, an interpretation of other diagnostic data, and a study of the diagnostic casts. The diagnostic casts are used in educating the patient about his/her dental needs and corresponding treatment plan.

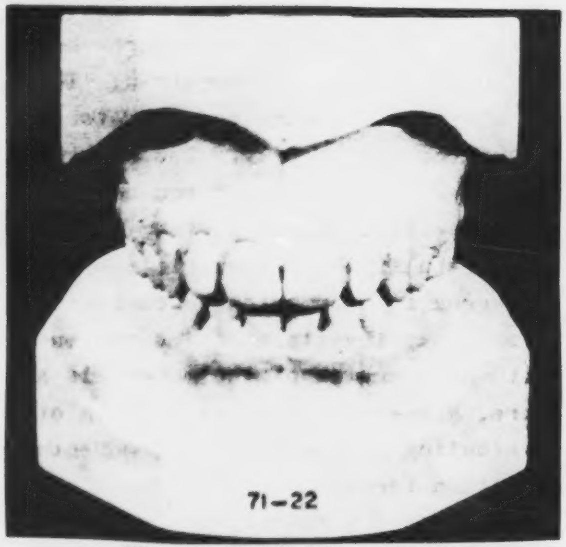

Figure 1. Finished diagnostic cast.

The casts are the final product and are produced in three distinct steps. First, the alginate impression is made directly in the patient's mouth producing a negative mold. Secondly, the impression is poured in dental stone, producing a positive cast. And finally the cast is inspected for defects, repaired if possible, and trimmed to the proper size and shape on a model trimmer.

This module presents a detailed explanation of the importance and procedure for obtaining an accurate alginate impression--the first step in acquiring a diagnostic cast.

PHYSICAL PROPERTIES OF ALGINATE

Alginate is an impression material that is supplied in powder form which is mixed with water and used to make negative impression molds in the patient's mouth. When set, the material is a flexible gel resembling rubber. Its most important characteristic is its ability to rebound from stresses (force applied on a given area). If one presses his fingernail into it, it rebounds to its original form, although more slowly than rubber. This ability to reform after being deformed makes alginate valuable as an impression material because objects that contain curved surfaces or undercuts can be copied. Alginate's ability to rebound is limited, in no way approaching that of rubber. Curiously, it rebounds from sudden shocks better than it does from prolonged strain (change in the shape of the material as a result of stress). Prolonged strain apparently breaks down the internal fibril structure.

COMPOSITION OF ALGINATE

Alginate is classified as irreversible hydrocolloid: hydrocolloid because it consists of particles of a gelatinous (colloidal) state in water (hydro), and irreversible because once it has jellied it cannot be returned to a sol (a liquid colloidal solution) by reversing the chemistry or changing the temperature. Alginate's powder contains several components. The alginate particles are salts of alginic acid, a product obtained from marine kelp. The powder also contains an activator, usually calcium sulfate, which converts the soluble alginate into a semi-rigid gel. A retarder, such as sodium phosphate, is added which keeps the chemical reaction from starting immediately, giving the operator time to complete mixing. An inert filler is also added to reduce stickiness, help produce a smooth texture, and add strength to the final gel. Since the added ingredients give the material a rather unpleasant taste, flavors such as lemon, peppermint, or spearmint are added.

PACKAGING OF ALGINATE

Alginate is packaged in either individual preweighted packages or bulk form. Bulk form is the more popular of the two, although individual packaging is a more desirable choice when temperature change and moisture are of concern.

Alginate is sensitive to higher temperature and moisture contamination. These variables cause the alginate to lose strength during mixing and be more apt to distort upon removal from the mouth. To alleviate temperature change and moisture contamination alginate needs to be stored in a dry, cool place. With bulk form, the operator is continually opening and closing the alginate container lid, which allows moisture from the air to cause erratic setting of the unused powder. After premeasuring the alginate place the lid back on the container immediately.

MIXING OF ALGINATE

Alginate in powder form consists of a variety of particles of varying sizes and specific gravities, causing some of the particles to settle to the bottom. Consequently, the alginate container should be given a vigorous shake before use. The top of the container should be opened carefully to prevent the very fine particles (dust) from being distributed around the operatory. New improved alginates with glycol added eliminate the presence of airborne particles making them dustless (e.g., Jeltrate Plus).

Use the specific measuring devices (water and powder measurers) provided by the manufacturer for mixing of alginate. The exact amount of water and powder is necessary for the success of the impression. Follow the manufacturer's direction regarding the ratio of water to powder.

After the water and powder have been measured, place the water in a clean dry bowl. Sift the powder into the water. Adding the powder to the water ensures the powder particles are wet evenly. If mixed in reverse, (the water is added to the powder) the chemical reaction will start early with some particles setting faster than others.

Mix the alginate for the specific amount of time (check the manufacturer's directions) and, using an appropriate spatula (stiff), "swipe" the alginate mass against the sides of the bowl to avoid entrapment of air in the mix. The end result should be a creamy, smooth homogenous mix without any unmixed powder left in the bowl. Inadequate mixing results in grainy mixes and poorer detail in the impression.

SETTING TIME OF ALGINATE

Since alginate reacts (gels) chemically, temperature is a factor in the setting time. The colder the temperature of the water the longer it takes for the alginate to set; conversely, the higher the water temperature the faster the alginate sets. With all other factors constant, an alginate that gels in 4.5 minutes at 68° Fahrenheit (ideal) will require 3.5 minutes at 86° Fahrenheit. At 59° Fahrenheit it will take 5.5 minutes. Hence, if the operator wishes the material to gel in the prescribed time, it is essential he make certain the water is at the recommended temperature by testing with a thermometer. To speed or retard the gelation time, he need only alter the temperature of the water used in the mix. Two types of alginate are marketed: a fast-setting type that gels in 1 to 2 minutes, and a normal type that gels in 2 to 4.5 minutes. The fast-setting type is the most widely used.

The alginate can be checked to see if it has set by touching the leftover material in the bowl for stickiness. If the material is set it will rebound when gently pulled. Alginate improves in elasticity its initial set and is ordinary held in place an extra minute.

DIMENSIONAL STABILITY

Alginate has a tendency, after it sets (gelation), to lose (syneresis) or absorb (imbibition) water, depending on the atmospheric conditions surrounding it. If conditions are dry, it loses water (shrinks); if immersed in water, it imbibes moisture (swells). In either case, the material is distorted by either shrinking or swelling. The material is dimensionally stable for only a brief period after it is removed from the mouth. The only sure way to prevent distortion is to pour the cast immediately. During syneresis the lost water appears on the surface; dissolved in it are some of the constituents of the material. These chemicals interfere with the setting of gypsum products used to make casts, producing a chalky, powdery surface.

Internal stress can be produced in alginate by movement during the gelation period or by one portion of the mass setting faster than another. The internal stresses often result in distortion of the impression.

ADVANTAGES OF ALGINATE

Although there are problems involved in the use of alginate, it does have certain advantages. It makes an accurate impression--although it is not as accurate as certain other materials, it allows for undercuts (the curved surfaces of the teeth), which some other materials do not. The process is not time consuming. The entire process from seating the patient to the trimmed model may take less than an hour, not counting the 45-minute wait for the dental stone or plaster to set. Alginate is easy to work with, has good viscosity (resistance to flow), and is low in adhesive qualities. It causes the patient no great discomfort and the dentist no great expense, and requires no extensive armamentarium. Alginate has been used with success for decades, and though efforts have been made to replace it, none so far have succeeded. By taking reasonable care it is possible to make many impressions without failure (high rate of success with the material).

TYPES OF IMPRESSION TRAYS

The alginate is carried to the mouth in an impression tray with an attached handle. The handle aids the operator in placing and removing the tray. Trays for holding the alginate are made of various metals, plastic, and styrofoam. The type of tray used depends on the operator's preference and convenience.

In making an impression, the alginate must be held securely in the tray; since its adherence property is poor, some physical means must be used to hold it in place. There are three types of trays, all in common use.

1. The perforated tray (Figure 2) has small holes drilled close together over the entire surface. When the tray is filled with alginate, some of the material seeps through the holes and locks on the opposite side, thereby ensuring retention of the alginate.

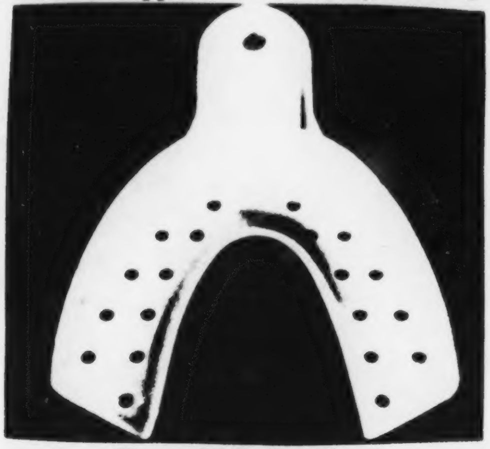

Figure 2. Perforated tray.

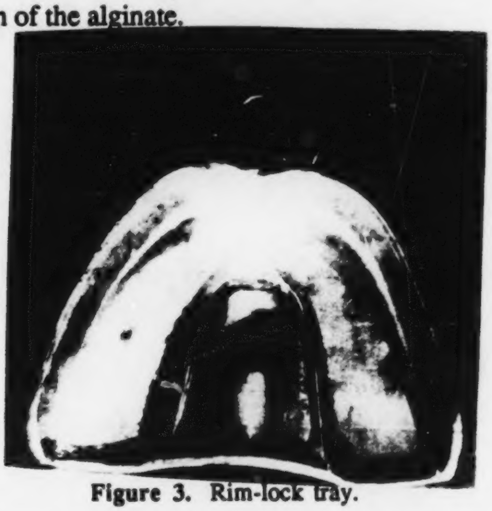

Figure 3. Rim-lock tray.

2. The rim-lock tray (Figure 3) has a slight flange around the periphery, extending inward. In addition, there is a wire loop in the bottom of the maxillary tray. The alginate is held firmly between the flanges and the loop.

3. The adhesive-type tray (Figure 4) is smooth. Up to 10 minutes before use, the operator paints an adhesive on the inside of the tray to which the alginate adheres.

Trays vary in shape depending on whether they are to be used on the maxillary arch (Figure 5) or the mandibular arch (Figure 2). The maxillary tray covers the entire palatal area and the mandibular tray is horseshoe-shaped allowing for tongue movement. Trays also vary in length and depth. In addition, there are special trays, that are less deep, for use in edentulous arches. There are also quadrant trays (Figure 6).

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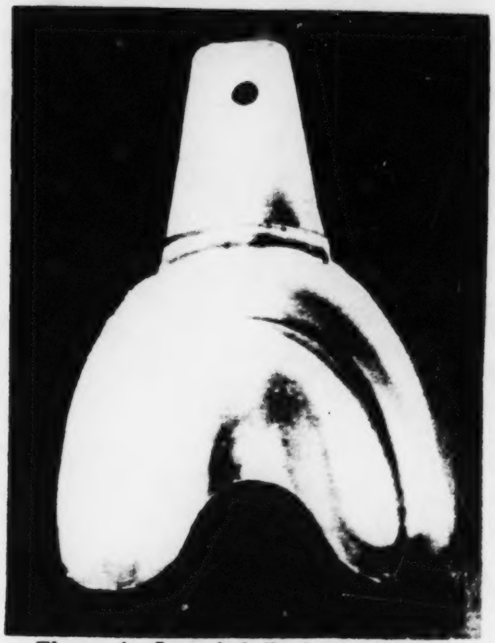

Figure 4. Smooth (adhesive-type) tray.

Figure 5. Maxillary tray.

Figure 6. Quadrant tray.

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TRAY SELECTION

The selection and subsequent modification of a tray is based upon three areas of judgment: 1) visual assessment of arch width and length; 2) pragmatic "trying" of the tray; 3) the patient's response concerning the fit, i.e., undue pressure or pain. While the tray should not touch any tissues, neither should it be so large that thick masses of alginate will result. Figure 7a illustrates tray placement during the fitting process; when the teeth touch the tray, the rim of the tray nearly reaches the peripheral turn. Figure 7b illustrates the tray position when it contains the alginate and is in place. The teeth do not contact the bottom of the tray and the alginate has not only filled the peripheral turn but distended it somewhat.

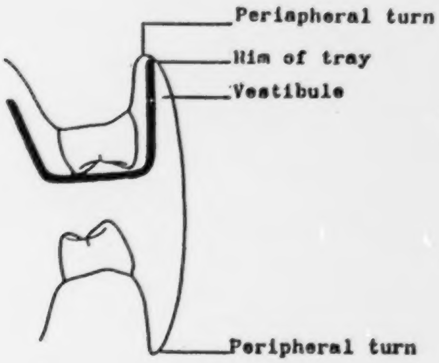

Periapheral turn
Rim of tray
Vestibule
Peripheral turn

Figure 7a. Empty tray in place.

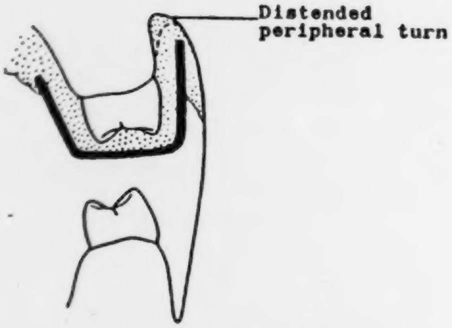
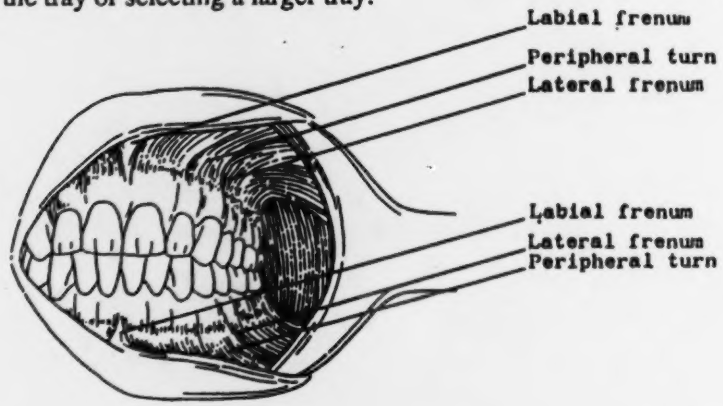

Distended
peripheral turn

Figure 7b. Tray with alginate in place.

Inspect the area to be covered by the impression. Examine the shape and size of the arches, frena (Figure 8 and 9), and ridges. Look for tori, and any other conditions that might require bending or extending the tray or selecting a larger tray.

Figure 8. Vestibule.


Labial frenum
Peripheral turn
Lateral frenum
Labial frenum
Lateral frenum
Peripheral turn

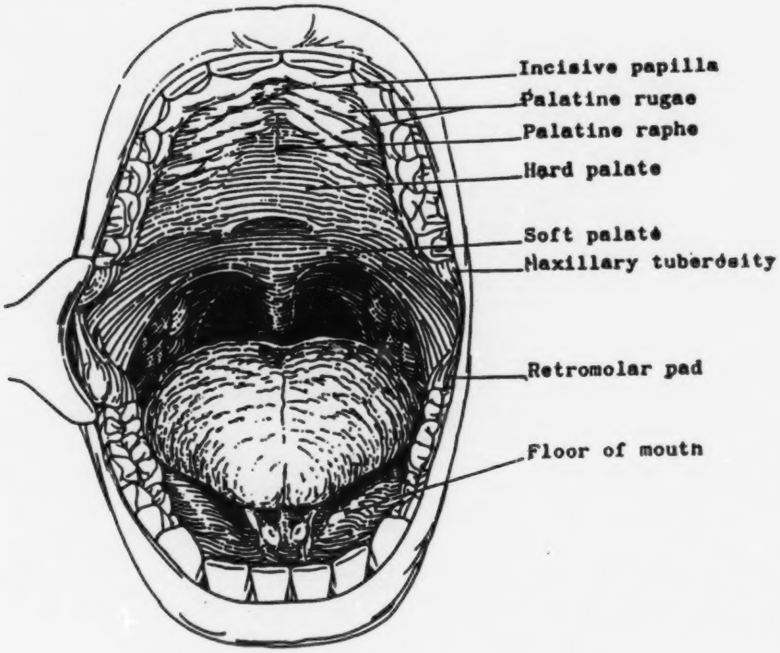

Incisive papilla
Palatine rugae
Palatine raphe
Hard palate
Soft palate
Maxillary tuberosity
Retromolar pad
Floor of mouth

Figure 9. Oral cavity.

When trying the tray in the patient's mouth, notice that the tray is considerably wider posteriorly than relaxed lips. Place one side of the tray about the center of its length in one corner of the patient's mouth. With your finger or mirror, distend the other corner and rotate the tray into the mouth.

Ask the patient about their discomfort level while the tray is in place. Explain that their mouth will feel "full" while the tray is in place but they should not experience any pain or discomfort. Make any adjustments necessary.

Use your mirror to retract the cheek in order to view the fit in the vestibule (perpherial turn). While viewing the mandibular tray fit ask the patient to lift his tongue to his palate, then, when the tray is seated, to let it slide forward.

TRAY MODIFICATIONS

Since trays and the shape of dental arches vary in so many ways, the operator sometimes finds it difficult to select a tray that fits properly. If such is the case, select one that has the correct width, but is not long enough. Using utility wax the tray can be extended to the desired length. If the patient's teeth protrude, the sides of a metal tray may require bending for both maxillary and mandibular arches. If the distance from the occlusal surfaces of the teeth to the peripheral turn is unusually great, the sides of the tray will require extension with wax.

After the tray has been selected, a strip of wax is molded around the periphery of the tray. The wax ensures a better fit in the vestibule and protects the patient from any sharp edge. Should the tray fall short of fitting in a given area, wax can be used to build up the edge. If the patient has a high palatal vault, the palatal portion of the tray can be built up with wax. Another technique employs pieces of wax 1/8 inch thick and about 1/2 inch square placed in the bottom of the tray: two pieces in a quadrant tray, three or four in a full-arch tray. The wax serves as a stop for the patient's teeth, keeping them from touching the bottom of the tray. The exact location of the wax stops is not critical; usually two are placed where the premolars will bite, two where the most distal molars will bite. Other operators use no stop wax at all and depend upon judgment for seating the tray to the proper depth. The rims of thin metal trays (except for the rim-lock) may be bent to fit the patient's mouth.

TRAY STERILIZATION

It is important to know what type of sterilization methods to follow in order to reuse an impression tray from one patient to another. Some trays are unable to be sterilized or disinfected and are for one time use only.

Metal trays can be sterilized in the autoclave and can be reused. Plastic trays are often considered disposable since sterilization is inefficient, but they can be placed in sterilizing solution and reused. Styrofoam trays are not reusable and must be discarded (disposable).

DISINFECTION OF IMPRESSION AND BITE REGISTRATION

Care must be taken to protect your dental staff and dental laboratory technicans when handling impressions and the wax bite registration. The same prevalance of antibodies to the hepatitis B virus are present in dental laboratory technicians as in other dental auxiliaries.

To begin the process of disinfecting an alginate impression and accompanying wax bite, it should be rinsed immediately after removal from the patient's mouth. Any blood, salvia, and debris should be rinsed off with a gentle flow of running water. Shake the excess water off both the impressions and wax bite and then spray each with the manufacturer's recommended disinfectant. The impression and wax bite are then placed in a sealed bag for the manufacturer's recommended disinfection time. Some examples of sprayable disinfectant compounds are: household bleach, chlorine dioxide, phenolics, or iodophor compounds.

If the impression and wax bite are to be sent off to the dental laboratory it should be placed in a sealed bag after the disinfecting process. The dental laboratory technician should be notified of any communicable diseases related to the case in question so precautionary measures can be taken at the lab.

STORAGE OF ALGINATE

There are times when an alginate impression cannot be poured in plaster/stone immediately and must be stored until there is time available to pour. In such circumstances, the impression is wrapped in a damp paper towel and placed in a humidor (sealed plastic container will do). Even if the delay between the removal of the impression and the pouring of the impression is only five minutes, the impression must be stored to avoid distortion. If there is an excess of material overhanging the impression tray (particularly common in the posterior region), it may inadvertently cause disposition of the adjacent jelled material. The excess material should be removed from the impression with the use of a lab knife before storing the impression.

LABELING OF THE IMPRESSION

The operator taking the alginate impression is not always the one who makes the stone cast, nor is he necessarily the one who puts it away. Consistent labeling is important. For labeling alginate impressions, a paper tag with attached string works well. (NOTE: For stone casts, the time-honored system of pencil painted over with fingernail varnish is effective). Some people like to use one of the various supposedly waterproof marking pens that are available; others prefer self-adhering labels. Whichever method you use, the essential label information is the name of the patient and the date the impressions or casts were made. Laboratory procedures may, however, require additional data.

GAGGING PATIENT--VARIATION IN TECHNIQUE

Patients vary greatly in their tendency to gag. With those who gag readily, and with some children, a technique used in the past has been to apply a little topical anesthetic to the soft palate. Numbing of the soft palate has a tendency to stimulate gagging so this technique is no longer advisable. If gagging should occur the operator needs to be confident and reassuring to the patient. It is important not to remove the tray before the material has set since the alginate will adhere to the interproximal surfaces of the teeth and be time consuming to remove. Additionally the fibril structure will be affected which diminishes the strength of the alginate. Some approaches for the operator to use with the gagging patient are:

1) Encourage the patient to breathe through his/her nose rather than mouth when the tray is being seated and throughout the setting of the material. Some patients will worry about their ability to breathe while the impression is being taken. Explain to the patient that the impression will take only a few minutes, and to breathe through his/her nose. If that proves difficult, it is still possible to breathe through the mouth.

2) Have the patient concentrate on an object in the operatory rather than the procedure (e.g., a spot on the wall), or have the patient lift his/her leg and hold it until the material sets.

3) An ice cube placed in the patient's mouth prior to taking the impression will have a numbing effect and may help prevent the gagging sensation.
4) Since nitrous oxide/oxygen inhalation sedation depresses the gag reflex, it can be used to relax the patient to reduce gagging during the taking of impression.
5) Alginate may extrude posteriorly and cause gagging in the patient. To prevent this possibility, you can construct a post dam, which is simply a dam of wax constructed across the posterior of the tray.

TONGUE SPACE OF THE MANDIBULAR IMPRESSION

Sometime before pouring the mandibular impression a "tongue" of alginate should be placed between the flanges of the mandibular tray. This "tongue space" alleviates a mound of excess plaster or stone from the floor of the mouth when the cast is poured. Mix a scoop of alginate and place it on your left index finger (if your hands are small, use two fingers). From beneath the tray place the alginate in the tongue space. Using moistened fingers of your right hand, join the alginate to the lingual borders of the impression, creating a smooth floor. Allow the alginate to set and remove the supporting left index finger.

The alginate for the tongue space should meet these criteria:
•The surface is smooth.
•The addition does not overlie the impression.
•The addition is generally flat.
•The addition is long enough to include the the retromolar pad.

ALGINATE IMPRESSION PROCEDURE

The steps of each procedure are described as though you were doing them without an assistant.

1. ASSEMBLE THE ARMAMENTARIUM

   a. patient drape
   b. impression trays
   c. flexible rubber or plastic mixing bowl: clean, dry and without scratches.
   d. stiff spatula with rounded end to prevent scratching the bowl.
   e. saliva ejector
   f. alginate of choice and manufacturer's measurers (water and powder).
   g. soft utility wax to prepare tray border and wax stops.
   h. manufacturer's recommended disinfecting agent

2. SEAT THE PATIENT

3. OPERATOR SHOULD WEAR EYEGLASSES, MASK, AND GLOVES

4. INSTRUCT THE PATIENT

   The muscles of the cheeks are strong enough to force the alginate out of the peripheral turn and/or move the tray, so it is important for the patient to relax. The patient's head should remain motionless with mouth in a relaxed open state, head resting comfortably against the head rest. Explain that the material is flavored (if applicable) and will feel cold when first placed.

5. POSITION THE PATIENT AND INSPECT MOUTH

   The patient should be seated upright with the occlusal surfaces of the teeth roughly parallel with the floor. Position yourself on the patient's right side facing the patient. Have the patient remove any removable appliance. A container with water is provided for the patient to place his/her appliance. Inspect the area to be covered by the impression for any conditions that might require bending or extending the tray or selecting a larger tray. Check to be sure the teeth are clean; impressions are best if the teeth have been cleaned recently. Remove food particles, materia alba, and plaque as necessary. Rinsing with mouthwash is helpful in removing debris and ropy saliva, and aids in lowering surface tension which prevents bubbles in the impression. Mouthwash also provides a pleasant taste for the patient.

6. LUBRICATE THE PATIENT'S LIPS

Lubricate the patient's lips with petroleum jelly to make tray insertion and removal easier and prevent alginate from adhering to the skin.

7. SELECT APPROPRIATE TRAYS

Mandibular Tray

Use the following criteria to assess the tray fit:

- The tray clears all tissues (buccal, posterior and anterior borders) by a least 4mm. Move the tray from side to side to make this appraisal.
- The tray is long enough to cover part of the retromolar pads (Figure 9), but not so long that it depresses the anterior border of the ramus. The ramus could inerfere by moving the tray forward which forces the inside curve of the tray against the incisors.
- The tray sides fall at least 4mm short of the peripheral turn.
- The tray sides do not grossly depress any frenum.
- The patient should not feel pain or excessive pressure.

Maxillary Tray

The following maxillary tray criteria should be met:

- The maxillary tray clears the tissues by at least 4mm.

- The tray is long enough to cover part of the maxillary tuberosities (Figure 9).
- The tray sides fall at least 4mm short of the peripheral turn.
- The tray sides should not grossly depress any frenum.
- The patient should not feel pain or pressure.

8. INSTALL THE WAX

Mold utility wax around the tray rim and place the squares of wax in the bottom. Notch the wax to fit around the labial frenem to alleviate patient discomfort if it should be a problem and to enable you to take a more accurate impression of the patient's oral landmarks.

9. MOLD THE WAX TO THE VESTIBULE

Reseat the tray and gently press the patient's cheeks against the periphery of the tray. This process molds the wax against the tissue, ensuring a better fit in the vestibule (Figure 7a) and reducing the possibility of alginate flowing out of the tray prematurely.

10. ASK THE PATIENT TO RINSE HIS MOUTH

The patient should rinse with water or mouthwash while you are preparing the alginate. Alginate takes best against a surface wet with water, less well against a surface wet with saliva.

11. PROPORTION THE WATER, AND TEST THE WATER TEMPERATURE

Ideally, a thermometer is used for testing the water temperature. If one is not available, use room temperature water (68° Fahrenheit).

12. PREPARE THE ALGINATE

Check the temperature of the water and shake the container of alginate. Mix the alginate and water according to the manufacturer's instructions. Remember to add the powder to the water rather than vice versa. Stir and spatulate for the recommended time (from 40 seconds to one minute). Spatulating the mix against the walls of the bowl helps to eliminate air. Rotate the mixing bowl in the palm of your hand during spatulation. Alginate should be smooth and free of bubbles. If the mix is too loose (soupy), discard it and mix again with less water.

13. LOAD THE TRAY

The mandibular arch is taken first. Many patients tend to gag on the maxillary impression because they experience the sensation that the alginate is flowing down their throats. If the mixture is too fluid or the tray overfilled gagging may actually occur. Taking the mandibular arch first helps to familiarize the patient with the procedure and increases his confidence.

Use the mixing spatula to load the tray rapidly with one to three increments. Wipe the spatula along the tray edge with each increment. If a perforated tray is used press some of the alginate through the holes to lock the impression material into place. Fill the tray with alginate until it is even with the utility wax border. Use a damp finger to smooth the surface of alginate before inserting the tray.

14. SEMI-DRY THE TEETH AND MUCOSA

Use either a gauze sponge or air syringe to dry the teeth and surrounding soft tissue.

15. APPLY A PRELIMINARY LAYER OF ALGINATE TO THE TEETH (optional step)

Using your forefinger, take up a scoop of alginate from the bowl and rub it over the occlusal surfaces of the patient's teeth. The occlusal surfaces are critical because their detail is fine and the alginate has little opportunity to flow. This technique reduces the possibility of surface air entrapment and aids in obtaining better detail. Additional alginate may be applied to other suspicious areas-- severe undercuts, for example. The operation must be completed swiftly and without allowing contamination by saliva. The patient's body temperature hastens the setting of alginate. If too much time elapses between the preliminary application and the seating of the tray the alginate in the tray may not cohere smoothly to the preliminary alginate. Ask the patient to retract and raise his tongue while the tray is being placed, then to let it relax as the tray is seated.

16. POSITION AND SEAT THE TRAY

Mandibular Arch Impression

When seated, the tray must be level, in all directions: from the posterior to anterior and side to side across the mouth. It cannot be off centered to one side or twisted. The handle should be positioned in the midline of the arch. The beginner often becomes so involved with one aspect of the seating that he misses the total picture. It is important to keep the basic alignment in mind during the entire process. When inserting the tray retract one side of the cheek with the side of the tray and rotate the tray into the mouth while retracting the other cheek with your other hand. Keep the top of the mandibular tray parallel with the opposing arch to achieve maximum visibility and working space. Seat the tray straight down, making sure that sufficient alginate flows to the deepest portions of both the lingual and facial aspects of the arch. Voids occur most frequently in these areas, especially in the vestibule adjacent to the lip. Pull out the lip to allow alginate to flow and displaced air to escape.

Maxillary Arch Impression

The procedures for casting the maxillary arch are the same except for a few variations. Although the patient remains seated upright for the maxillary impression, the operator should stand behind the patient.

In order to capture the peripheral turn of the maxillary arch, make sure that the sides of the tray reach into the vestibule. It may be necessary to build up certain areas with wax.

Inspect the patient's palatal arch (Figure 9); if it is unusually high, extra wax is added to the palatal area of the tray. The tray should be long enough to include the tuberosities (Figure 9) and the hamular notch (notch behind tuberosity).

Seat the tray in the posterior first and then the anterior. There are two reasons for seating the tray at the posterior first: 1) when the tray is seated anteriorly first, alginate tends to squeeze toward the posterior leaving an inadequate amount to fill the anterior vestibule adjacent to the lip; and 2) in squeezing the excess alginate to the posterior, you run the risk of gagging the patient. As the tray is being seated, lift the patient's lip to allow alginate to flow into the area, then let the lip lie comfortably over the tray. As a precaution against gagging, seat the tray and ask the patient to lean forward slightly and to breathe through his nose. (See Gagging Patient--Variation in Technique page 20).

17. REMOVE EXCESS ALGINATE

Remove any gross excess of alginate with the dental mirror. Drag it forward to prevent alginate from entering the patient's throat.

18. HOLD THE TRAY STEADY FOR THE PRESCRIBED TIME

Very little pressure is required. Excessive pressure will produce distortion. Use even pressure with your fingers in the biscuspid area. Regular alginate can be removed two minutes after the initial gel; hence, it is a good idea to hold it in position an extra minute. Hold the tray in place to alleviate any tray movement that might occur from swallowing, etc., during the setting process.

19. REMOVE THE TRAY

Run your index finger around the periphery to break the air seal. Give the tray a slight tilt to make certain the seal is broken in all areas. Remove the tray with a quick pull in line with the long axis of the teeth. When doing so, keep two fingers on the occlusal surfaces of the opposite arch you are taking to prevent injury to the teeth. Wiggling the tray out of the mouth will cause distortion of the impression.

20. REMOVE BITS OF ALGINATE FROM THE MOUTH AND ALLOW PATIENT TO RINSE

21. RINSE THE IMPRESSION

Rinse the impression briefly in running water to remove saliva, blood, debris and/or bits of loose alginate. Shake excess water off. The impression should be kept damp, but not wet. Wrap the impression in a damp paper towel and place in a humidor until time to disinfect.

22. EVALUATE THE IMPRESSION.

Mandibular Impression

The impression should meet the following criteria:

- All detail is reproduced, including the complete peripheral turn and a portion of the retromolar pads.
- The detail is sharp, not blurred or indistinct.
- The impression is free of voids in critical areas.
- The impression is free of large folds of alginate.
- There are no areas where the alginate has pulled away from the tray.
- The impression is free of rips and tears, except in interproximal areas.
- Alginate thoroughly covers the tray (no tray is visible through the alginate).
- The impression is free of bulges or depressions that indicate a sub-surface bubble.
- The alginate is smooth, not sponge-like.

Maxillary Impression

Use the same criteria used for evaluating the mandibular impression for the maxillary impression and add:

- Impression includes part of both maxillary tuberosities.
- Palatal arch is complete.

Often one is not certain that a particular area has been reproduced--all the peripheral turn, for example. A judgement can be made on the basis of the appearance of the alginate. When alginate has been impressed against a wet membrane, a smooth, shiny surface is produced; when it has set without touching anything, it has a slightly rough, mat (dull) surface.

The alginate impression in Figure 10 is unsatisfactory for several reasons: the large palatal void, the void on the occlusal surface of tooth # 15, the tear on the lingual of tooth # 4, and the pitted texture of the palate. Figure 11 shows another set of deficiencies: exposure of the metal tray, a tear, and granular texture. In practice, the acceptability of an impression depends upon its purpose. If it is to be used for an acrylic temporary crown, for example, and both the tooth being restored and the adjacent teeth are in good condition, one may overlook minor defects in other areas. Do not attempt to repair small imperfections in an impression; they are much more easily repaired in the stone cast. If there are large defects in noncritical areas, you can melt wax directly into the alginate to repair them. The presence of the tongue prevents obtaining an impression of the floor of the mouth. This floor is artificially constructed with excess alginate mixed for the mandibular impression.

23. TRIM AWAY EXCESS ALGINATE

Using a sharp lab knife, trim away any excess alginate around the periphery, especially along the bottom of the tray. Pressure applied to an extensive area, such as might occur when the tray is left to rest on a surface, may distort the impression in adjacent areas. Be careful not to remove any alginate in areas that must be used as reference points.

24. TAKE THE WAX BITE REGISTRATION

After taking both the mandibular and maxillary impression an interocclusal bite record is needed to correctly relate the mandibular model to maxillary model during the trimming process. A soft moldable wax is used to obtain a registration of the patient's occlusion. The wax is manufactured in a horseshoe shape. It is slightly heated by either warm water or passed over a bunsen burner flame. The wax is placed on the mandibular arch and the patient is asked to gently bite into the wax. After the wax cools it can be removed from the patient's mouth. Store the wax after it has been disinfected in a cool dry place so the wax does not distort. Make sure the wax is identified and placed with the appropriate impressions.

25. DISINFECT THE IMPRESSION

Use the manufacturer's recommended spray disinfectant for the alginate you are using. Spray the impression and wait the recommended time. If the impression is being sent to the laboratory, wrap it in a sealed bag.

26. LABEL THE IMPRESSION AND STORE IT

Attach a label to the impression tray. Wrap it in wet towels and store it in a humidor. Figure 12 illustrates the shrinkage that takes place when alginate is not stored in a humid enivronment.

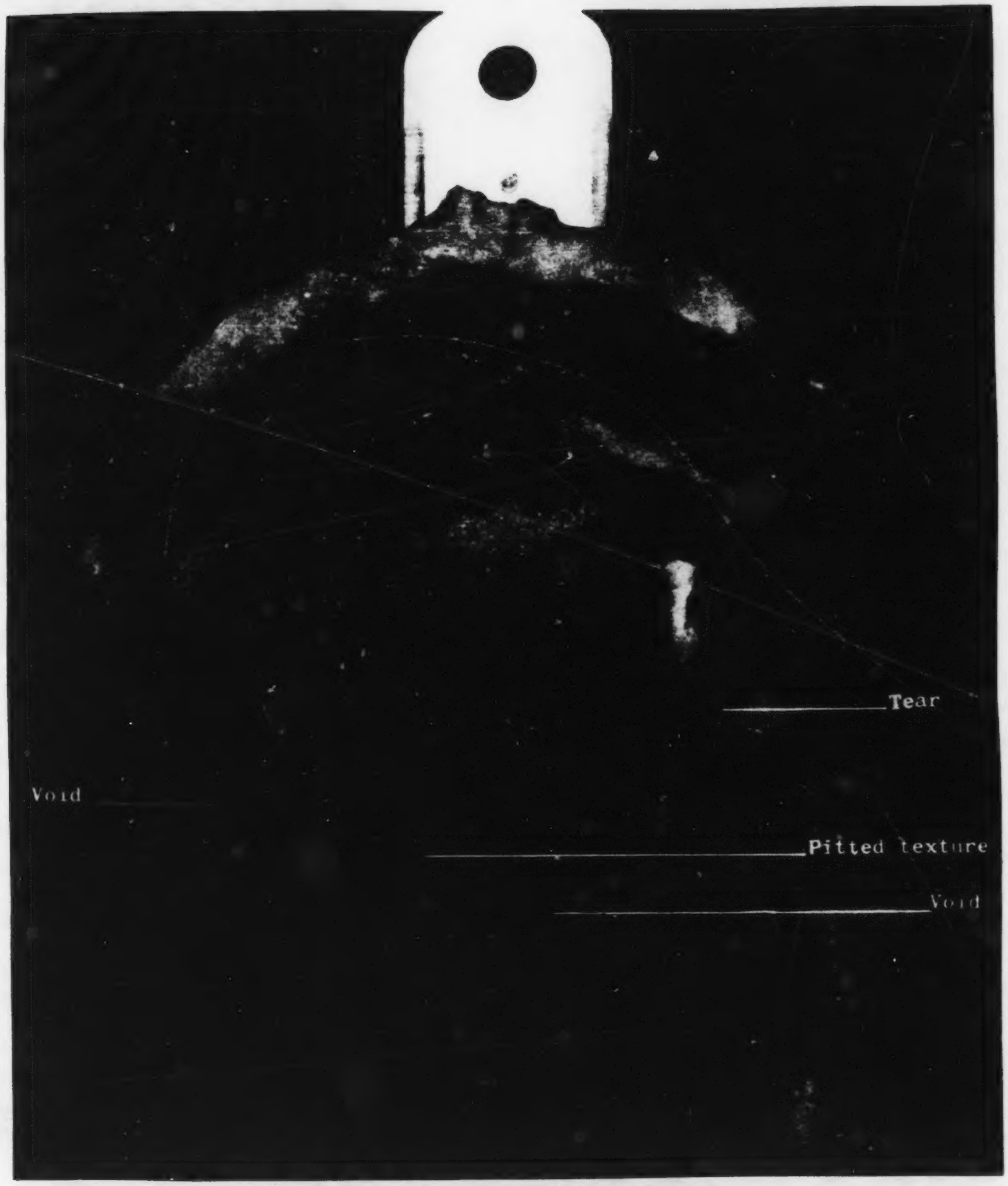

Tear
Void
Pitted texture
Void

Figure 10. Unsatisfactory alginate impression.

BEST COPY AVAILABLE

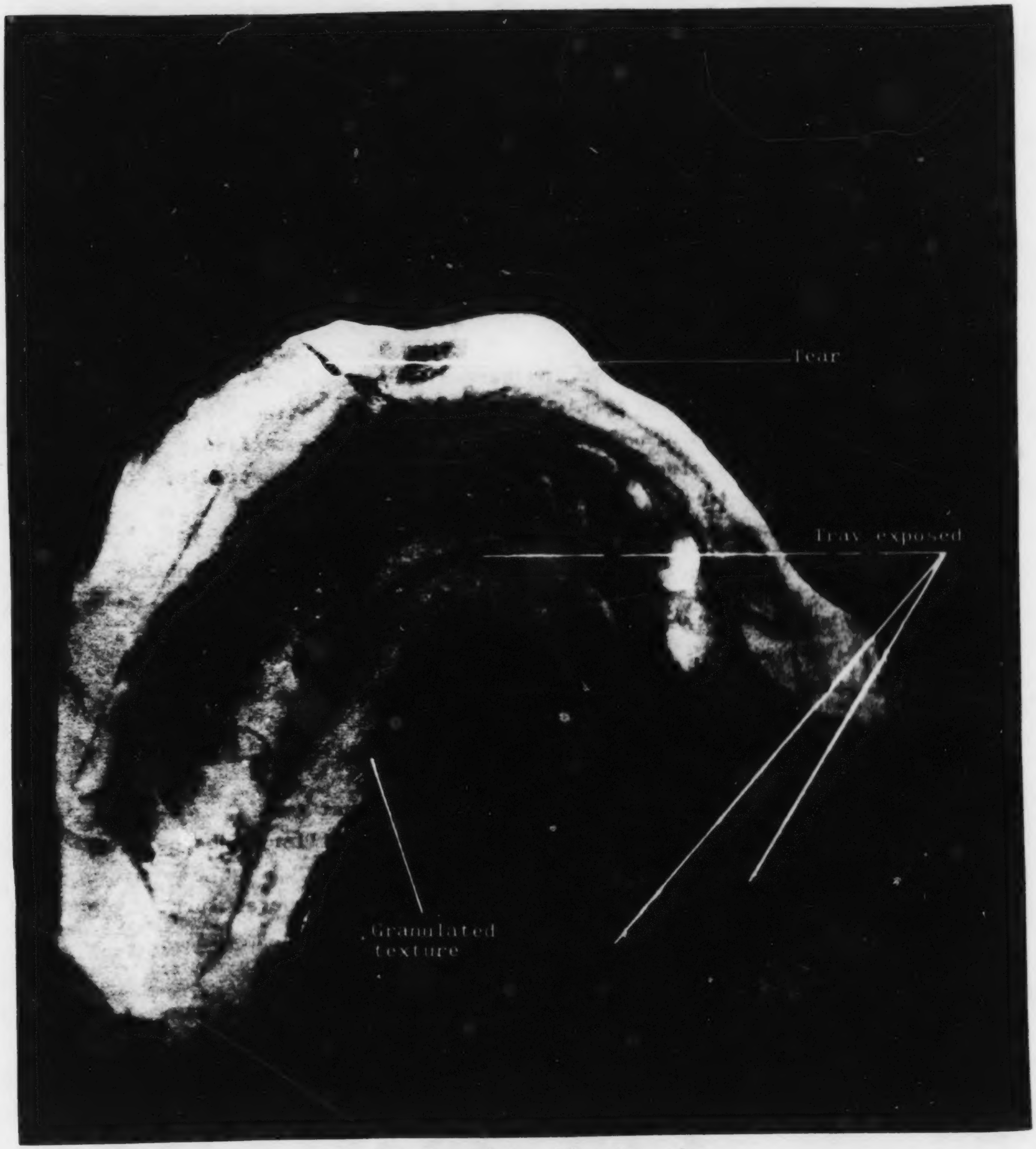

Tear
Tray exposed
Granulated texture

Figure 11. Unsatisfactory alginate impression.

BEST COPY AVAILABLE

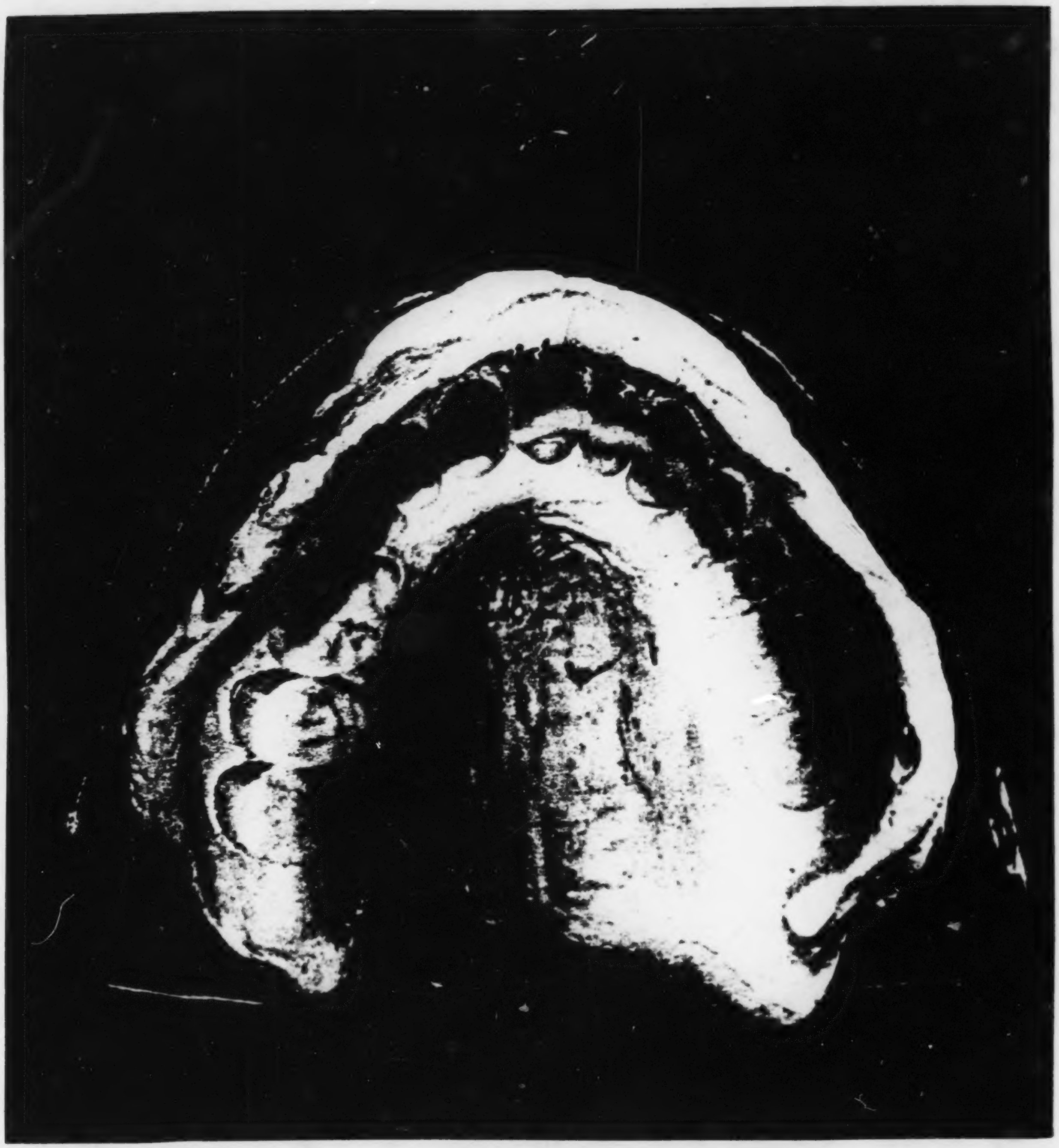


Figure 12. Shrinkage of alginate when stored with inadequate humidity.

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Defects in the Impression and Possible Causes

Alginate is sponge-like.	Alginate was inadequately mixed.
Impression does not include portion of maxillary tuberosity or retromolar pad.	Tray too short or seated short.
Impression does not capture peripheral turn.	Sides of tray not high enough. Too little alginate. Tray not seated far enough.
Tears in alginate and alginate sticking to teeth.	Teeth too dry. Too early or rough removal.
Details blurred.	Tray moved during gelation. Tray seated after gelation started.
Rough alginate surface.	Insufficient or prolonged spatulation. Water too warm or improper W/P ratio. Tissues inadequately cleansed. Inadequate removal of saliva.
Bubbles, bulges, or depressions.	Air entrapment caused by poor spatulation, poor tray loading, or poor seating
Tearing of alginate along edge of tray.	Alginate too thin or teeth too dry. Removal of tray too rough, too rapid, or too slow.
Separation of alginate from tray.	In a perforated tray, alginate not keyed through holes. In a smooth tray,insufficient or dry adhesive.
Tray visible through alginate.	Wrong size tray. Tray not seated squarely, or seated too far without stops.

STUDY QUESTIONS

Directions: Answer the following questions on a separate piece of paper to the best of your ability. You may use your module to look up needed information. Upon completion of the questions, review all responses to familiarize yourself with pertinent information.

1. What is a diagnostic cast used for?

2. What is an alginate impression?

3. What is alginate's most important characteristic? Why is it important?

4. Your patient wants to know why he/she needs the alginate impression. Explain the importance of the impression and diagnostic casts.

5. How is alginate classified? Explain the meaning of the classification.

6. List the components of alginate.

7. Describe the way that alginate is packaged. List the advantages and disadvantages of both methods.

8. Explain the proper method of mixing alginate from start to finish.

9. How does temperature affect setting time?

10. What is the type of reaction that occurs when alginate gels?

11. What is the normal setting time of alginate?

12. How do you check alginate to see if it has completely set?

13. What is average mixing time of alginate?

14. Describe the difference between syneresis and imbibition? Explain how these variables can be prevented.

15. List the advantages of alginate as a impression material.

16. Describe the three types of commonly use trays.

17. Describe how to select and modify an appropriate size tray.

18. Explain the sterilization method for the various types of trays.

19. How should the impression and wax registration be disinfected prior to further handling either by a staff member? Prior to being sent to a dental laboratory technician?

20. How should an alginate be stored if it cannot be poured immediately?

21. Why and how are impressions labeled?

22. Explain approaches for dealing with a gagging patient.

23. Why and how is tongue space added to a mandibular impression?

24. Why is the mandibular impression taken before the maxillary impression?

25. Describe the procedure for loading the tray.

26. How should a maxillary and mandibular tray be seated in the mouth?

27. When removing the tray, why should you not rock it back and forth to release it ?

28. In taking the impression of the mandibular arch, what should you do to be sure you capture all of the peripheral turn?

29. Where should the tongue be positioned when taking an mandibular impression?

30. Explain the criteria for evaluating a maxillary and mandibular impression.

Review the defects of alginate impressions and possible causes of the defects on page 20 of the module.

REFERENCES

Craig, R.G., editor, Restorative Dental Materials, eighth edition, the C.V. Mosby Company, 1989.

Phillips, R.W., Elements of Dental Materials, fourth edition, W.B. Saunders Company, 1984.

Wilkins, E.: Clinical Practice of the Dental Hygienist, fifth edition, Lea & Febiger, 1989.

Woodall, I.R., Dafoe, B.R., Young, N.S., Weed-Fonner, L., Yankell, S.L, Comprehensive Dental Hygiene Care, third edition, the C.V. Mosby Company, 1989.

U.S. Department of Health, Education and Welfare. Taking Alginate Impressions for Study Casts, HEW Contract No. 231-75-0407. Produced by Quercus Corporation, 1976.

TAKING ALGINATE IMPRESSIONS FOR STUDY CASTS
EVALUATION FORM

Clinician________________________ Patient____________________

Date____________________________ Instructor__________________

Key: C = Criterion Met = 2

I = Criterion Improvable = 1

X = Unacceptable = 0

* = Critical task; if a 2 is not achieved on a critical task, the process evaluation is unsatisfactory and must be redone.

		SELF			*INSTRUCTOR*		
TASK		**C**	**I**	**X**	**C**	**I**	**X**
MANDIBULAR							
1.	All detail is reproduce, including the complete peripheral turn and a portion of the retromolar pad.	2	1	0	2	1	0
2.	The detail is sharp, not blurred or indistinct.	2	1	0	2	1	0
3.	Impression is free of voids in critical areas	2	1	0	2	1	0
4.	Impressions is free of large folds of alginate	2	1	0	2	1	0
5.	There are no areas where the alginate has pulled away from the tray.	2	1	0	2	1	0
6.	Impression is free of bulges or depressions that indicate a subsurface bubble.	2	1	0	2	1	0
7.	Impression is free of rips and tears, except in interproximal areas.	2	1	0	2	1	0
8.	Alginate thoroughly covers the tray (no tray is visible through the alginate).	2	1	0	2	1	0
9.	The alginate is smooth, not sponge-like	2	1	0	2	1	0

________/18

________%

For tongue space on the mandibular arch:

1. The surface is smooth.	2	1	0	2	1	0
2. The addition does not overlie the impression.	2	1	0	2	1	0
3. The addition is generally flat.	2	1	0	2	1	0
4. The addition is long enough to include the retromolar pads.	2	1	0	2	1	0

________/8

________%

MAXILLARY

1. All detail is reproduced including the complete peripheral turn, the maxillary tuberosities, palatal arch.	2	1	0	2	1	0
2. The detail is sharp, not blurred or indistinct.	2	1	0	2	1	0
3. Impression is free of voids in critical areas.	2	1	0	2	1	0
4. Impression is free of large folds of alginate.	2	1	0	2	1	0
5. There are no areas where the alginate has pulled away from the tray.	2	1	0	2	1	0
6. Impression is free of rips and tears, except in interproximal areas.	2	1	0	2	1	0
7. Alginate thoroughly covers the tray (no tray is visible through the alginate.	2	1	0	2	1	0
8. Impression is free of bulges or depressions that indicate subsurface bubble.	2	1	0	2	1	0
9. The alginate is smooth, not sponge-like.	2	1	0	2	1	0

________/18

________%

Module 6-B

TAKING ALGINATE IMPRESSIONS FOR STUDY CASTS

Final Examination

Name____________________
Date_____________________
Grade__________

TAKING ALGINATE IMPRESSIONS FOR STUDY CASTS
WRITTEN EXAMINATION

Directions: Circle the best answer to the questions below.

1. An alginate impression is a ______________ mold of the teeth.
   a. positive
   b. negative

2. Alginate is classified as:
   a. a reversible hydrocolloid
   b. an irreversible hydrocolloid
   c. a reversible plaster
   d. an irreversible plaster

3. The type of reaction that occurs when alginate gels is a:
   a. physical reaction
   b. thermal reaction
   c. chemical reaction

4. The setting time for a normal set alginate is:
   a. 30 seconds
   b. 1-2 minutes
   c. 2-4.5 minutes
   d. 5-6 minutes

5. The average mixing time for alginate material is:
   a. 40 seconds to 1 minute
   b. 60 seconds to 1 1/2 minutes
   c. 55 seconds to 2 minutes

6. Increasing the temperature of the water used to mix alginate material will:

1. decrease the setting time
2. increase the setting time
3. cause syneresis
4. cause imbibition

ANSWER:
a. 1 only
b. 2 only
c. 1 and 3
d. 1 and 4
e. 2 and 3
f. 2 and 4

7. The opposite of imbibition is:

a. gelation
b. moisture contamination
c. polymerization
d. syneresis

8. Criteria for selection of the appropriate tray size for an alginate impression include:

1. tray clears all tissues by at least 4mm
2. tray does not cover the retromolar pads
3. tray sides clearly depress frenum
4. the patient does not feel pain or discomfort

ANSWER:
a. 1 and 3
b. 1 and 4
c. 2 and 4
d. 1, 2 and 4
e. 2, 3 and 4
f. all of the above

9. If an impression tray is the correct width, but not long enough, what can be done to ensure an adequate impression?

a. select a larger tray
b. fill the tray with extra alginate
c. seat the tray from the anterior to posterior
d. add extra wax to the back of the tray

10. Holding the patient's lip out so that it is completely extended and very tight while taking an alginate impression will result in:

a. "flattened" peripheral roll
b. a void in the peripheral roll
c. alginate sticking to the teeth

11. To minimize gagging and overcome fear, the ________ impression is taken first.
   a. mandibular
   b. maxillary

12. The proper position for the patient's tongue while taking a mandibular impression is :
   a. rested on the floor of the mouth
   b. extended to the roof of the mouth

13. When removing an impression from a patient's mouth the air seal is "broken" by:
   a. running you index finger around the periphery of the tray
   b. using a quick, snapping motion to remove the tray
   c. using a slow, even motion to remove the tray

14. Proper storage for alginate impressions includes:
   1. wrapped in dry cloth
   2. wrapped in damp cloth
   3. immersed in water
   4. placement in a humidor

ANSWER:		
	a. 1	e. 1 and 4
	b. 2	f. 2 and 4
	c. 3	g. 3 and 4
	d. 4	

Circle "a." if the statement is correct or "b." if the statement is incorrect.

15. Diagnostic casts are a supplement to the oral examination.
   a. correct
   b. incorrect

16. Care should be taken in shaking a "dustless" can of alginate.
   a. correct
   b. incorrect

17. Air entrapment can be minimized and a better mix can be obtained if the water is added to the powder rather than the powder to the water.
   a. correct
   b. incorrect

18. The handle of the tray should be positioned in the midline of the arch.
    a. correct
    b. incorrect

19. The alginate impression should be removed with a snap to minimize distortion.
    a. correct
    b. incorrect

20. Impressions only need to be rinsed and bagged before being sent to the laboratory.
    a. correct
    b. incorrect

Name__**KEY**__________

Grade__________

ALGINATE IMPRESSIONS
WRITTEN EXAMINATION

Directions: Circle the best answer to the questions below.

CORRECT ANSWERS ARE IN BOLD TYPE.

1. An alignate impression is a _____________ mold of the teeth.
   a. positive
   b. negative

2. Alginate is classified as:
   a. a reversible hydrocolloid
   b. an irreversible hydrocolloid
   c. a reversible plaster
   d. an irreversible plaster

3. The type of reaction that occurs when alginate gels is a:
   a. physical reaction
   b. thermal reaction
   c. chemical reaction

4. The setting time for a normal set alginate is:
   a. 30 seconds
   b. 1-2 minutes
   c. 2-4.5 minutes
   d. 5-6 minutes

5. The average mixing time for alginate material is:
   a. 40 seconds to 1 minute
   b. 60 seconds to 1 1/2 minutes
   c. 55 seconds to 2 minutes

6. Increasing the temperature of the water used to mix alginate material will:
   1. decrease the setting time
   2. increase the setting time
   3. cause syneresis
   4. cause imbibition

ANSWER: **a. 1 only** c. 1 and 3 e. 2 and 3
b. 2 only d. 1 and 4 f. 2 and 4

7. The opposite of imbibition is:
   a. gelation
   b. moisture contamination
   c. polymerization
   d. syneresis

8. Criteria for selection of the appropriate tray size for an alginate impression include:
   1. tray clears all tissues by at least 4mm
   2. tray does not cover the retromolar pads
   3. tray sides clearly depress frenum
   4. the patient does not feel pain or discomfort

ANSWER: a. 1 and 3 d. 1, 2 and 4
b. 1 and 4 e. 2, 3 and 4
c. 2 and 4 f. all of the above

9. If an impression tray is the correct width, but not long enough, what can be done to ensure an adequate impression?
   a. select a larger tray
   b. fill the tray with extra alginate
   c. seat the tray from the anterior to posterior
   d. add extra wax to the back of the tray

10. Holding the patient's lip out so that it is completely extended and very tight while taking an alginate impression will result in:
   a. "flattened" peripheral roll
   b. a void in the peripheral roll
   c. alginate sticking to the teeth

11. To minimize gagging and overcome fear, the ________ impression is taken first.
  a. mandibular
  b. maxillary

12. The proper position for the patient's tongue while taking a mandibular impression is :
  a. rested on the floor of the mouth
  b. extended to the roof of the mouth

13. When removing an impression from a patient's mouth the air seal is "broken" by:
  a. running you index finger around the periphery of the tray
  b. using a quick, snapping motion to remove the tray
  c. using a slow, even motion to remove the tray

14. Proper storage for alginate impressions includes:
  1. wrapped in dry cloth
  2. wrapped in damp cloth
  3. immersed in water
  4. placement in a humidor

ANSWER: a. 1
b. 2
c. 3
d. 4
e. 1 and 4
f. 2 and 4
g. 3 and 4

Circle "a." if the statement is correct or "b." if the statement is incorrect.

15. Diagnostic casts are a supplement to the oral examination.
  a. correct
  b. incorrect

16. Care should be taken in shaking a "dustless" can of alginate.
  a. correct
  b. incorrect

17. Air entrapment can be minimized and a better mix can be obtained if the water is added to the powder rather than the powder to the water.
  a. correct
  b. incorrect

18. The handle of the tray should be positioned i
    a. correct
    b. incorrect

19. The alginate impression should be removed
    a. correct
    b. incorrect

20. Impressions only need to be rinsed and bagg
    a. correct
    b. incorrect

should be positioned in the midline of the arch.

on should be removed with a snap to minimize distortion.

l to be rinsed and bagged before being sent to the laboratory.

Module 7

CORONAL POLISHING

Module 7-A

CORONAL POLISHING

Instructor's Guide

USE OF THE MOUTH MIRROR

A GUIDE FOR INSTRUCTORS

LISA S. FLEMING, R.D.H., B. S., M.A.

USE OF THE MOUTH MIRROR

SYNOPSIS

The mouth mirror is utilized when performing an oral inspection, and during instrumentation procedures for indirect vision, illumination, transillumination and retraction. This audiovisual program presents the proper technique for insertion of the mouth mirror and use of a fulcrum when using it for indirect vision, illumination, transillumination and retraction.

Techniques which can cause patient discomfort such as retracting the buccal mucosa with the shank and resting the mirror head on the alveolar bone are demonstrated. All of the procedures shown in this audiovisual program are demonstrated on a patient.

Background Knowledge

For this audiovisual program to be most effective, the student should be familiar with the following fundamentals:

- design and classification of prophylaxis instruments
- basic dental terminology
- basic dental anatomy
- intraoral landmarks

Terminology

The following terms are used in this instructional tape:

angles of mouth
anterior teeth
buccal mucosa
dental unit
distal
extraoral fulcrum
facial
fulcrum
illumination
indirect vision
lingual
mirror head
modified pen grasp
movable tissue
occlusal plane
oral inspection
oral mucosa
palm grasp
posterior teeth
retraction
shank
transillumination

Objectives

Upon completion of this instructional tape, and with supervised practice, the student will be able to:

1. Correctly demonstrate the use of the mouth mirror when performing an oral inspection.
2. Correctly demonstrate the use of the mouth mirror during instrumentation procedures.
3. Correctly demonstrate the use of the mouth mirror for indirect vision, illumination, transillumination and retraction.

USE OF THE PROPHYLAXIS ANGLE AND HANDPIECE

A GUIDE FOR INSTRUCTORS

LISA S. FLEMING, R.D.H., B.S., M.A.

Use of the Prophylaxis Angle and Handpiece

SYNOPSIS

Polishing refers to the use of an abrasive to create a smooth tooth surface. This can be accomplished by the use of the prophylaxis angle and motor driven handpiece, porte polisher and by air polishing. This audiovisual program presents the indications, contraindications and correct technique for using the prophylaxis angle and motor driven handpiece.

The mechanism for attachments to the prophylaxis angle is presented, as well as the indications for use of the different abrasive agents. Correct technique, including proper grasp, fulcrum and activation of the prophylaxis angle is demonstrated on a patient.

Background Knowledge

For this audiovisual program to be most effective, the student should be familiar with the following fundamentals:

- basic dental terminology
- basic dental anatomy
- characteristics of abrasive agents
- proper grasp, fulcrum and activation of an instrument
- characteristics of the soft deposits that form on the teeth
- design features of the prophylaxis angle and motor driven handpiece

Terminology

The following terms are used in this instructional tape:

abrasive
activate
aerosols
airpolishing
armamentarium
bacteremia
bristle brushes
cementum
central groove
cervical 1/3
coarse abrasive
cones
contraindicated
curettage
decalcification
deep subgingival scaling
dentin
dentition
distal
fine polishing paste
firm
flared
flexible
floss
fluoride
frictional heat
fulcrum
gingival margin
gingival tissue

grooving
hard deposits
heavy stain
inflammed gingival tissues
interproximal
irrigation
junctional epithelium
light stain
lubricated
manipulation
manual polishing
medium abrasive
mesial
minimal pressure
moderate stain
modified pen grasp
motor driven handpiece
newly erupted teeth
occlusal
overlapping strokes
patting motion
pediatric patient
periodontal patient
pit
pointed shape
polishing paste
porte polisher
prophylaxis angle
pulp
rheostat
ribbed
root planing
rotary equipment
rubber cups
sequence
slow speed
soft deposits
standard shape
sterilized
topical fluoride treatment
trauma to gingiva
webbed
wiping motion

Objectives

Upon completion of this instructional tape, and with supervised practice, the student will be able to:

1. List 7 contraindications for use of the prophylaxis angle and handpiece.
2. Identify the appropriate attachments and abrasive agent to be used on a given patient.
3. Identify the rationale as to why a topical fluoride treatment is indicated following polishing procedures.
4. Demonstrate correct technique for use of the prophylaxis angle and handpiece.

INSTRUMENT GRASP
USE OF A FULCRUM
AND
INSTRUMENT ACTIVATION

A GUIDE FOR INSTRUCTORS

LISA S. FLEMING, R.D.H., B. S., M.A.

INSTRUMENT GRASP USE OF A FULCRUM AND INSTRUMENT ACTIVATION

SYNOPSIS

When performing intraoral procedures, it is essential that an appropriate grasp and fulcrum be utilized in order to practice both stable and efficient instrumentation. This audiovisual program presents the fundamental principles to be used in establishing a fulcrum and activating an instrument.

This audiovisual program features demonstrations of the palm grasp, modified pen grasp, exploratory stroke, working stroke, as well as intraoral and extraoral fulcrums. A manikin is utilized in the program to demonstrate a fulcrum on anterior and posterior teeth. Additionally, the concept of keeping the shank of the instrument parallel to the long axis of the tooth is graphically illustrated in the program.

The two fundamental movements for activating an instrument are presented: the rolling arm and the rocking arm motion. The program concludes with the operator performing these techniques on a patient.

Background Knowledge

For this audiovisual program to be most effective, the student should be familiar with the following fundamentals:

- design and classification of prophylaxis instruments
- basic dental terminology
- basic dental anatomy
- universal tooth numbering system

Terminology

The following terms are used in this instructional tape:

air and water syringe
anterior curet
anterior teeth
exploratory stroke
hard deposits
incisal
long axis of tooth
extraoral fulcrum
intraoral fulcrum
instrument activation
intraoral
modified pen grasp
mouth mirror
occlusal
oral tissues
palm grasp
posterior teeth
rocking arm motion
rolling arm motion
shank
working area
working stroke

Objectives

Upon completion of this instructional tape, and with supervised practice, the student will be able to:

1. Correctly demonstrate and/or describe the modified pen grasp.
2. Correctly demonstrate and/or describe the palm grasp.
3. Correctly demonstrate the use of a fulcrum when performing intraoral procedures.
4. Correctly demonstrate the rolling arm motion when activating an instrument.
5. Correctly demonstrate the rocking arm motion when activating an instrument.

Module 7-B

CORONAL POLISHING

Final Examination

CORONAL POLISH EXAMINATION

Name:______________________________

Date:_______________________________

Score:___________________(Possible 46)

1. Which of the following phrases describes what is polished during the coronal polish procedures? (1 point)

   a. anatomical crown
   b. clinical crown
   c. normal crown
   d. ideal crown

2. Which of the following phrases best describes the goal of the coronal polish procedure? (1 point)

   a. to remove all soft and hard deposits from the teeth
   b. to remove all intrinsic stains from the teeth
   c. to remove stains, films and dental plaque from the teeth
   d. to remove all extrinsic stains from the teeth

3. Which of the following is not a usual function of the explorer during the coronal polish? (1 point)

   a. It is used to determine if stains on the teeth are intrinsic or extrinsic
   b. It is used to remove stain from the teeth
   c. It is used to determine when all deposits have been removed from the teeth
   d. It is used to determine if stains are attached to hard deposits

4. Which of the following explains the major reason for using water or other lubricant to wet the abrasive agent? (1 point)

   a. to make it easier to carry to the tooth in the rubber cup
   b. to make it more palatable for the patient
   c. to make stain removal easier
   d. to minimize heat production during polishing

5. The pressure gauge on the dental unit should read how many pounds of pressure during use of the handpiece for coronal polishing? (1 point)

   a. 6 - 9 lbs.
   b. 10 - 13 lbs.
   c. 14 - 17 lbs.
   d. 18 - 21 lbs.

6. Which surfaces of the teeth are not adequately polished with the rubber prophy cup? (1 point)

   a. facial
   b. lingual
   c. interproximal
   d. occlusal
   e. b and d
   f. c and d

7. Normally which part of the rubber cup does the polishing? (1 point)

   a. a portion of the inner surface of the edge
   b. a portion of the outer surface of the edge
   c. the middle of the cup
   d. the side of the cup

8. 3% hydrogen peroxide is particularly effective in removing which type of stain? (1 point)

   a. orange stain
   b. green stain
   c. tobacco stain
   d. tea stain

9. Interproximal surfaces and gingival surfaces of fixed restorations (e.g., bridges) are best polished with which of the following? (1 point)

   a. rubber cup and abrasive agent
   b. brush and abrasive agent
   c. dental tape and abrasive agent
   d. soft wooden point and abrasive agent

10. The polishing stroke is best described by which of the following phrases? (1 point)

   a. short, light and intermittant
   b. short, heavy and intermittant
   c. short, light and continuous
   d. long, light and continuous

11. Dental floss should be carried through the contact at which angle? (1 point)

   a. horizontally
   b. at an oblique angle
   c. vertically

12. The handpiece should be activated Before/After touching the tooth with the rubber cup. (Circle correct response - 1 point)

13. The polishing instrument best suited to polish the occlusal surfaces of the teeth is the rubber cup/brush. (Circle correct response - 1 point)

14. The more particles of abrasive applied to the teeth per unit of time the Lower/Faster the rate of abrasion. (Circle correct response - 1 point)

15. Write yes or no in each blank to indicate whether or not the listed abrasive agent is appropriate on the surfaces. (9 points)

Flour of pumice	Zirconium silicate	Tin oxide
Enamel____________	Enamel____________	Enamel____________
Root surface________	Root surface________	Root surface________
Gold______________	Gold______________	Gold______________

16. Abrasion/Polishing is defined as the wearing away of surface material by friction. (Circle correct response - 1 point)

17. T F Presence of highly inflamed or traumatized gingiva is a contraindication for the coronal polish procedure. (1 point)

18. T F A patient chart entry is not considered complete unless it is written in ink. (1 point)

19. T F Using the pad of the third/middle finger resting on the instrument or handpiece increases control when manipulating the instrument. (1 point)

20. T F State laws regulating dental practice including performance of the coronal polish are uniform. (1 point)

21. T F As the operator during a coronal polish you are morally obligated to request assistance and/or consultation when the procedure requires skills or training beyond your level. (1 point)

22. T F The saliva ejector is the best device to remove pumice and saliva from the patient's mouth during the coronal polish procedure. (1 point)

23. T F Disclosing solution is applied after the coronal polish to help evaluate the effectiveness of the coronal polish procedure. (1 point)

24. T F Items placed on the patient tray need to be sterilized or disposed of only if they have directly contacted the patient's mouth. (1 point)

25. T F If the coronal polish patient has had his medical history reviewed within the past week, you need not review it again. (1 point)

26, T F 3% hydrogen peroxide is used undiluted to help remove green stain. (1 point)

27. T F Operator safety glasses are one means of preventing disease transmission during the coronal polish procedure. (1 polish)

28. T F It is the operator's obligation to see to it that a qualified person removes hard deposits from the teeth before or during the coronal polish procedure when they are detected. (1 point)

29. Describe the appearance gingival abrasion caused by improper use of the rubber cup. (2 points)

30. Explain the three topics you would discuss with a patient regarding the coronal polish procedure. (3 points)

31. When you self-evaluate your coronal polish what 5 criteria should have been met. (5 points)

FINAL EXAMINATION

CORONAL POLISH - KEY

1. b
2. c
3. b
4. d
5. b
6. f
7. a
8. b
9. c
10. a
11. b
12. before
13. brush
14. faster
15.

Flour of Pumice	Zirconium Silicate	Tin Oxide
Enamel - yes	Enamel - yes	Enamel - yes
Root Surface - no	Root surface - yes	Root Surface - yes
Gold - no	Gold - yes	Gold - yes

16. Abrasion
17. T
18. T
19. T
20. F
21. T
22. T
23. T
24. F
25. F
26. F
27. T
28. T

29. Whitish burned area or red abraded or bleeding area.
    Uneven gingival margin.

30. a. Purpose of coronal polish
    b. General sequence of procedures
    c. Description of any sensation patient may experience during the procedure.

31. a. Smooth tooth surface
    b. Lustrous/shiny tooth surface
    c. Tooth surface free of deposit (extrinsic stain, soft deposit)
    d. Gingival tissue has not been traumatized
    e. Mouth free of abrasive particles

Module 7-C

CORONAL POLISHING

Student Module

CORONAL POLISHING
FOR
DENTAL ASSISTANTS

DEVELOPED BY

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Coronal Polish

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CORONAL POLISH

Clock Hours:

Lecture/Demonstration	3 hours
Laboratory/Clinical	3 hours laboratory 8 hours clinical
Written Examination	30 minutes
Final Practical Examination:	For the convenience of both students and examiners, it is suggested that the final exam for this course be offered concurrently with the final exam for pit and fissure sealant. By doing so, it will be necessary to obtain only one patient.

Course Description:

The primary objective of this course is to provide the dental assistant with the background knowledge and clinical experience in coronal polishing to enable them to perform this procedure in a practice setting. Upon successful completion of this course, the students will receive a certificate of completion/recognition indicating competency in performing this procedure.

Required Text:

Coronal Polish, a self-study module developed by Carole Kawamura, RDH, MEd.; Idaho State University; 1991.

Course Requirements:

For successful completion of this course, each participant must complete the following requirements:

1. Attend all class, laboratory and clinic sessions.
2. Polish on a dentoform in the laboratory setting.
3. Polish on a clinic partner and a patient who is not a course participant.
4. Achieve a minimum of 75% on a written examination.
5. Successfully complete the final practical examination at a minimum of 85.7% to receive a certificate of completion/recognition to perform this function.

6. Materials to be supplied by the student:

   a. dental handpiece
   b. prophylaxis/right angle
   c. rubber polishing cups
   d. bristle brushes (straight and tapered)
   e. polishing paste
   f. cotton swabs
   g. disclosing solution
   h. dental tape
   i. dental floss
   j. finishing strips

Evaluation/Grading:

This course is designed on a pass/fail basis. In order for the student to pass the course, the requirements listed on page 1 must be successfully completed. As previously stated, the minimum percentage for acceptable coronal polish is 85.7% and a minimum of 75% must be achieved on the written examination. A description for determining the percentage scores is presented below.

A. Calculating Percentages for Coronal Polish

Refer to the attached evaluation form. Each criteria is evaluated as follows:

C = Acceptable: Criteria met as stated

I = Improvable: moderately effective, needs improvement

X = Unacceptable: inefficient, harmful

NE = not evaluated

Points are assigned to each of the above.

C = 2 points
I = 1 point
X = 0 points

Since there are 35 criteria, each worth a maximum of 2 points, there are a total of 70 points possible for the coronal polish procedure. A percentage score can then be calculated by adding the total number of points earned and dividing by the total points possible.

B. Calculating Percentages for Written Examination

46	100	
45	98	
44	96	
43	93	
42	91	
41	89	
40	87	
39	85	
38	83	
37	80	
36	78	
35	76	Proficiency level
34	74	
33	71	
32	70	

Objectives:

Following completion of lecture and laboratory/clinical activities the student will be able to:

1. Explain the Idaho regulation with regard to coronal polish.
2. Explain the rationale for selective polishing vs. polishing the entire dentition.
3. Recognize when modification or deferment of coronal polish is indicated.
4. Recognize situations where skills and training beyond personal ability are required and request assistance as needed.
5. List the armamentarium required to perform coronal polish.
6. Explain the function of each component of the armamentarium.
7. Evaluate the patient's mouth and determine the appropriate polishing agent for the coronal polish procedure.
8. Explain aseptic technique as it applies to this procedure.
9. Explain the technique for polishing with motor driven instruments and auxiliary polishing aids.
10. Explain why a secure grasp and stable fulcrum are necessary for this procedure and describe how to establish them.

11. Explain the uses of the mouth mirror when coronal polishing.

12. Evaluate procedure and the final product to determine whether it meets the criteria for acceptability.

13. Maintain armamentarium and treatment area as required.

Procedure:

1. Read self-study module, Coronal Polish.

2. Answer study questions in the module.

3. For supplementary reading, refer to references listed under bibliography of the module.

COURSE SCHEDULE

Clock Hours	Method of Instruction	Topic/Activity	Assigned Readings
3	Lecture/ Demonstration	Introduction to course Goal of coronal polish Rationale for coronal polish Legal and Ethical considerations related to coronal polish Patient care Armamentarium for coronal polish Aseptic technique Coronal polish technique, laboratory & clinical --patient operator position --grasp, fulcrum --use of mirror and explorer --Use of handpiece --maintenance of operative area --use of rubber cup --use of bristle brush --use of dental tape --use of abrasive polishing strips --use of dental floss --evaluation procedure	Coronal Polish self-study module
17 min. 40 sec.	Videotapes	View University of Alabama videotapes "Grasp, Fulcrum," "Use of mouth mirror, use of handpiece"	
3 hrs.	Laboratory	Coronal polish on dentoform	
2 hrs.	Clinical	Coronal polish on a student partner Complete an acceptable coronal polish on a patient *Refer to course requirements	
30 mins.	Written Examination	A comprehensive written exam consisting of multiple choice and/or true/false questions.	

NOTE: The final practical examination is offered in conjunction with the Pit and Fissure Sealant final examination.

CORONAL POLISHING
PIT AND FISSURE SEALANTS
PERMISSION SLIP

This is to verify that I examined ______________________________________
(patient name)

on ______________________ and diagnosed the treatment approved below. I give my
(date)

permission for this patient to receive coronal polishing and/or pit and fissure sealants as

part of the Statewide Expanded Functions for Dental Assistants certification program.

☐ Coronal polish (check here if hard deposits have been removed and treatment is approved)

☐ Pit and Fissure Sealants (check here if teeth were radiographically and clinically examined and treatment is approved)
Please list tooth/teeth approved for sealants:

________	________
________	________
________	________
________	________
________	________

Dentist Signature___________________________

Date___________________________________

According to Idaho State law, the application of pit and fissure sealants and coronal polishing are procedures that must be diagnosed by a dentist. Patients receiving treatment in this program must receive permission from his/her family dentist before the procedure(s) can be performed. Return this form to the course instructor.

INTRODUCTION

This course is designed for currently employed assistants to provide them with the knowledge and skills necessary to perform, under direct supervision, the expanded function of coronal polish as provided for in the Regulations of the Idaho State Board of Dentistry, Section 10 C, ii (f), and iv, i. The regulation states, "None of the foregoing provisions shall, however, be construed to authorize or allow a dental assistant to perform any of the activities prohibited in Section 54-924, Idaho Code, nor any of the activities below:

> (i) Coronal polishing, unless authorized by a Certificate of Registration; this refers to the technique of removing soft substances from the teeth with pumice or other such abrasive substances with a rubber cup or brush. This in no way authorizes the mechanical removal of calculus nor is it to be considered a complete prophylaxis. This technique (coronal polish) would be applicable only after examination by a dentist and removal of calculus by a dentist or dental hygienist."

Therefore, this course presents the knowledge and skills necessary for coronal polish using a rubber cup and bristle brush and does not present the techniques for coronal polish using any air abrasive polishing device such as the Prophy Jet.

CORONAL POLISH

Goal:

Polish the clinical crowns of teeth to remove any extrinsic stain and soft deposit with minimum trauma to the hard or soft tissues and with minimum discomfort to the patient.

Rationale:

Polishing has traditionally been viewed as the finishing procedure of the oral prophylaxis. Over the last several years (since the early 1980's), the concept of selective polishing of teeth exhibiting stain, rather than routine polishing of all the teeth has been discussed. The rationale for selective polishing is partly to ensure that the patient realizes his or her role in maintaining oral cleanliness; the patient has the major responsibility for plaque removal, and partly to minimize polishing away the fluoride-rich outer layer of enamel.

Routine polishing of all tooth surfaces has also become questionable because studies have shown polishing does not improve the uptake of professionally applied fluoride and polishing changes the shape of the teeth after several years of routine care.

The clinical rationale for polishing or not polishing is still being investigated, but the trend is to selectively polish to remove obvious stains and to work with developing the patient's ability to remove his or her plaque in areas where the patient is having difficulty with plaque removal.

The main purpose of coronal polish under this new concept is for removal of stain that cannot be removed by the patient.

Your own office philosophy regarding coronal polishing should be determined. Should the office decide to follow the concept of selective polishing, it is wise to share with the patient the purpose for polishing, the effect of repeated polishing on the teeth, the rate of reformation of plaque on the teeth after polishing, and how the patient can participate in ongoing prevention of dental disease. A discussion of these concepts is recommended because many patients have previously learned that coronal polishing is a necessary part of a complete oral prophylaxis for the maintenance of "healthy gums."

Scope of the Module:

This module is a pre-laboratory and pre-clinical exercise which will provide you with the basic knowledge necessary to prepare you for laboratory practice and then clinical practice in coronal polish procedures. One laboratory exercise is included in this module to enhance understanding of the principles and procedures of coronal polishing. This laboratory practice will include coronal polishing of all surfaces of all the teeth in order to develop the skill necessary to coronal polish all teeth in all areas of the mouth.

The polishing method described includes all the basic techniques required to accomplish a satisfactory coronal polish except for the procedures required for polishing removable dental appliances.

The student should be aware that this module does not include the techniques for removal of hard deposits (i.e., calculus) from the tooth surface. Calculus removal is a highly technical procedure which requires extensive training. Also, the Regulations of the Idaho State Board of Dentistry prohibits assistants from performing a prophylaxis. Section 10, C, iv, j which reads, "Any oral prophylaxis. (The law specifically forbids an assistant from performing a prophylaxis--this must be done by a licensed dentist or a licensed hygienist.)" The coronal polish includes only polishing techniques for removing extrinsic dental stains which are not incorporated within hard deposits and soft deposits from the clinical crowns of teeth. Coronal polish is to be accomplished only after complete removal of all hard deposits by a qualified person. Should you find any hard deposits remaining on the teeth while you are performing the coronal polish, it is your responsibility to see that a qualified person removes them.

This module only presents the technique for coronal polishing with a prophylaxis angle using a rubber cup or bristle brush as specified in the Regulations of the Idaho State Board of Dentistry, Section 10, iv, i. It does not include the technique of air abrasive air-powder polishing, as this technique has not been approved as a function which may be performed by a dental assistant.

OBJECTIVES

After completing this module, you should be able to:

1. Explain the Idaho regulations with regard to coronal polishing.
2. Explain the rationale for selective polishing vs. polishing the entire dentition.
3. Recognize when modification or deferment of coronal polish is indicated.
4. Recognize situations where skills and training beyond personal ability are required and request assistance as needed.
5. List the armamentarium required to perform coronal polish.
6. Explain the function of each component of the armamentarium.
7. Evaluate the patient's mouth and determine the appropriate abrasive agent for the coronal polish procedure.
8. Explain aseptic technique as it applies to this procedure.
9. Explain the technique for polishing with motor driven instruments and auxiliary polishing aids.
10. Explain why a secure grasp and stable fulcrum are necessary for this procedure and describe how to establish them.
11. Explain the uses of the mouth mirror when coronal polishing.
12. Evaluate procedure and the final product to determine whether it meets the criteria for acceptability.
13. Maintain armamentarium and treatment area as required.

LEGAL AND ETHICAL CONSIDERATIONS

Each state has a dental practice act which regulates the practice of dentistry in that state. The law differs as to who may perform which types of dental procedures including the coronal polish procedure. It is the responsibility of each dental auxiliary to be aware of and abide by the governing regulations of the state in which they practice.

Idaho State Dental Practice Act:

As of July 1, 1989, the Regulations of the Idaho State Board of Dentistry were amended to include polishing of coronal surfaces of the teeth and application of pit and fissure sealants by dental assistants who have successfully completed courses, which have been approved by the Idaho State Board of Dentistry.

Ethics:

The law requires formal training and education before one can perform this procedure. It is also the moral and ethical responsibility of every auxiliary performing coronal polishing to sufficiently prepare himself/herself to be able to perform at a high standard.

The patient's health and safety are your responsibility when performing this procedure. If an emergency arises or if diagnostic decisions are necessary during treatment, request immediate assistance from the dentist/supervisor.

It is also your responsibility to request assistance or consultation from a more qualified individual when the procedure requires skills or training beyond your level of competency (as when calculus is present and you are not legally qualified to remove it).

PATIENT CARE

There are some important factors which should be considered when performing a coronal polish for a patient. This section addresses those factors.

Evaluation of the Patient's Condition:

Evaluation of the patient's medical, dental and psychological condition prior to, during, and following the coronal polish is an important aspect of the coronal polish procedure. It will assist you with making appropriate clinical decisions about the care and service you provide the patient.

Before beginning the coronal polish, determine whether the patient's oral and medical conditions have been evaluated by another qualified person and briefly review the findings with him/her to familiarize yourself with any conditions requiring special care. If the patient has not been previously evaluated, you should review the medical/dental history with the patient, assess his/her current psychological state, and perform an oral examination to determine whether any conditions exist which might contra-indicate or modify your procedures.

It is suggested that coronal polishing should be postponed or is contraindicated in the following situations: Polishing is contraindicated when: (1) no unsightly stain is present; the principle of selective polishing is not to polish unless necessary; when stain is present on specific tooth surfaces, polishing can be applied to selected areas without having to cover all the teeth in a generalized procedure; (2) when a patient is at increased risk for dental caries; such as rampant caries (nursing bottle caries, root surface caries), presence of thin enamel (amelogenesis imperfecta), areas of demineralization, and the presence of xerostomia (dry mouth); (3) patients with respiratory problems; (4) in areas of hypersensitivity; and, (5) newly erupted teeth.

Conditions requiring postponement of polishing are: (1) when instruction for personal plaque removal has not yet been given or the patient has not demonstrated adequate plaque control; (2) when the gingival tissues are soft and spongy and bleed readily upon brushing or gentle instrumentation; and, (3) immediately following deep subgingival scaling, root planing or soft tissue curettage.

The medical/dental conditions which might contra-indicate coronal polish procedures are the same as those which contra-indicate other types of general dental procedures. It is expected that you are already familiar with the implications of findings from the medical/dental history and oral inspection as they relate to providing dental care. If not, review this information before attempting this procedure for clinical patients.

Consult with your instructor or the supervising dentist if you have questions concerning the advisability of performing coronal polish procedures on a particular patient.

Conditions Requiring Modification in Technique/Procedure:

Herpes simplex (cold sores) are readily transmissible, therefore, contraindicate performance of the coronal polish procedures. When herpes are present, the coronal polish should be deferred until the lesions have healed.

Allergies may indicate the need to substitute another product for one you normally use. Fortunately, allergies to most of the commonly used products for coronal polish are fairly unusual. The products of concern for allergies are specific ingredients contained in disclosing solutions, lip lubricant, or polishing agent.

Coronal polish procedures may aggravate ulcerations and/or wounds of the lips and intraoral tissues and highly inflamed or traumatized gingiva thereby complicating the healing process. When these conditions are present, it is best to postpone coronal polishing until healing takes place. If the lesions are small or are located in an area that will not be disturbed you may proceed with coronal polishing. Lip wounds may be covered with a light coating of lubricant to protect them.

Hypersensitive teeth require slight modification in the coronal polish procedure. The pain resulting from hypersensitive areas is a very sharp extremely uncomfortable pain. Consequently, areas of hypersensitivity should be avoided with the rubber cup and abrasive agent. Use of the rubber cup and abrasive agent is contra-indicated because hypersensitivity is the result of exposed dentinal tubules due to minimal or lack of cementum or enamel. Use of an abrasive agent further reduces the amount of cementum or enamel. Stain and/or plaque in these areas needs to be removed but should be removed through scaling or toothbrushing. The stain should be removed by scaling. Local anesthesia may be required to perform the scaling. The plaque may be removed by scaling or by toothbrushing. Use of compressed air to dry the teeth should be avoided in areas of hypersensitivity. A gauze wipe, cotton roll, cotton swab, or cotton pellets may be used instead. Use only lukewarm water for rinsing. Avoid positioning the vacuum tip or saliva ejector close to the sensitive teeth as they may also cause discomfort due to temperature change.

When green stain due to chromogenic bacteria is present, it requires slight alteration of the polishing procedure. Enamel underneath green stain is frequently decalcified making it easy to burnish the stain into the enamel if only a rubber cup and polishing agent are used. When green stain is present, a solution of 3% hydrogen peroxide diluted in an equal amount of water should be prepared in a dappen dish. Apply the solution to the stained areas with a cotton swab. Leave the solution in place for 20-30 seconds, then rinse thoroughly. Then use the rubber cup and polishing agent as you would normally. The peroxide should remove most of the stain.

Try to avoid applying peroxide on the gingiva in order to minimize tissue irritation. The peroxide may make the gingiva tingle slightly so you should forewarn the patient that this may occur.

Orthodontic and other fixed appliances or temporary restorations may require alteration of normal procedures. Consult your instructor, or the supervising dentist for specific procedures to be followed for each situation.

Patient Preparation:

Before the coronal polish procedure is begun, the patient should be physically and psychologically prepared for the procedure. The patient should be seated comfortably. A patient bib should be placed to protect clothing. Dentures and partials should be removed and placed in a container with water or mouthwash until they can be polished. The lips should be lubricated to keep them from drying out and to prevent them from becoming stained when applying disclosing solution. You may want to have protective eye wear for the patient or you may instruct the patient to close their eyes during the polishing procedure to protect their eyes from splattering debris. At the completion of polishing, all polishing debris must be removed from the patient's mouth, face, hair and clothes before he/she is dismissed.

The patient should be prepared psychologically for the procedure by informing him of what you think he/she might want to know about the procedure. The information given will vary for each individual but will generally include:

1. The reasons for doing a coronal polish;
2. The sequence of procedures to be performed; and,
3. A description of any sensation the patient might experience during the procedure.

Chart Entry:

For legal documentation, the coronal polish must be recorded completely and accurately in the patient's record. The entry should be in ink, dated and signed by the person who performed the procedure. A description of any additional procedures performed at the appointment should also be included in the chart entry.

Summary

1. Review all the patient assessment data (medical/dental history, oral examination, psychological condition) before performing the coronal polish procedure.

2. Contra-indications for coronal polish should be identified.

3. Conditions which require modification in coronal polish technique and procedures include:

   a. herpes simplex
   b. allergies
   c. ulcerations or other wounds of the lips or intra-oral tissues
   d. highly inflamed or traumatized gingiva
   e. hypersensitive teeth
   f. presence of green stain
   g. orthodontic and other fixed appliances
   h. temporary restoration

4. The patient should be prepared both physically and psychologically for the coronal polish procedure.

5. Accurate chart entry for coronal polish should be made.

IDENTIFICATION OF DEPOSITS PRIOR TO CORONAL POLISH

It is very important to evaluate the deposits present before beginning the coronal polish. You should determine whether the stain can be removed. If it can be removed, will removal be accomplished by coronal polishing procedures or will it require scaling.

You must also determine the presence of supramarginal calculus as polishing a tooth surface with calculus will burnish the calculus making it more difficult to detect and remove.

Soft deposit should also be identified so it can be effectively removed or if you are selectively polishing, you can identify the areas to assist the patient with plaque removal.

INTRODUCTION

View Photograph #1 This is a photograph of a patient's teeth before the coronal polish. All hard deposits have been removed. There is some stain present but the teeth are ready to be polished. View Photograph #2 This shows the patient's teeth after disclosing with a disclosing solution. The areas of plaque are readily visible. View Photograph #3 This shows the teeth after the coronal polish has been completed. Note the clean, shiny stain-free, smooth appearance of the teeth. (Refer to Page 11 for photographs.)

On completion of this module, you should be able to perform a coronal polish which will render the tooth surface free of stains and soft deposits with minimal trauma to the patient's hard and soft tissues.

ARMAMENTARIUM

The armamentarium required for this procedure is listed below. It should be placed on a clean instrument tray and kept covered or placed in a clean storage area until ready for use. The items left-to-right correspond with the numbered items in the list below and in the diagram on Page 12.

1. Tray with tray cover
2. Mouth mirror
3. Explorer
4. 12-18" piece of dental floss
5. Dappen dish containing disclosing solution
6. 2 x 2 gauze sponges (3-5 should be sufficient)
7. Cotton swabs (2)
8. Finger cup containing wet abrasive agent or commercially prepared abrasive agent
9. Rubber prophylaxis cup
10. Prophylaxis brush
11. Prophylaxis angle
12. Saliva ejector or vacuum tip
13. Handpiece
14. Patient bib and chain
15. Dental tape
16. Lip lubricant (i.e., vaseline)
17. *Bridge/floss threaders
18. *Abrasive polishing strips
19. *Hydrogen peroxide

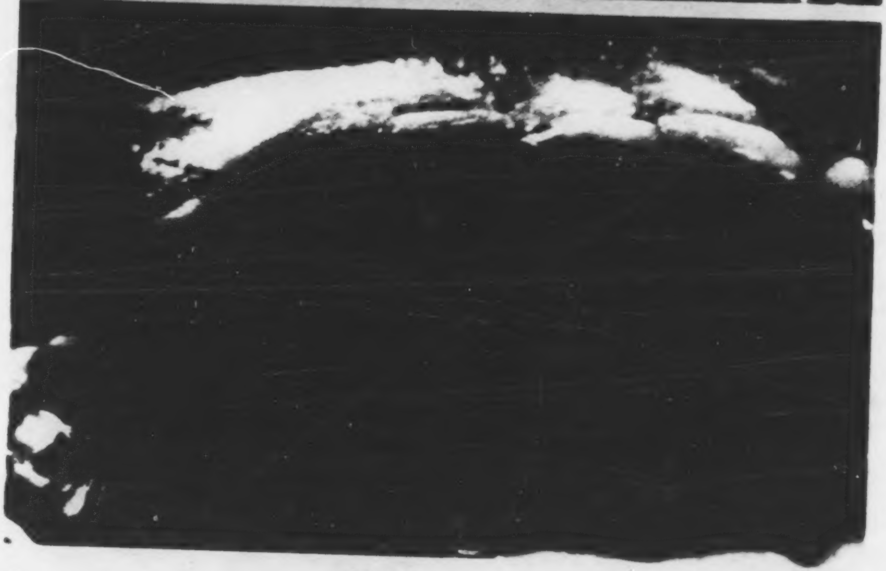
*Required only for specific patient conditions.

PHOTOGRAPHS

VIEW 1

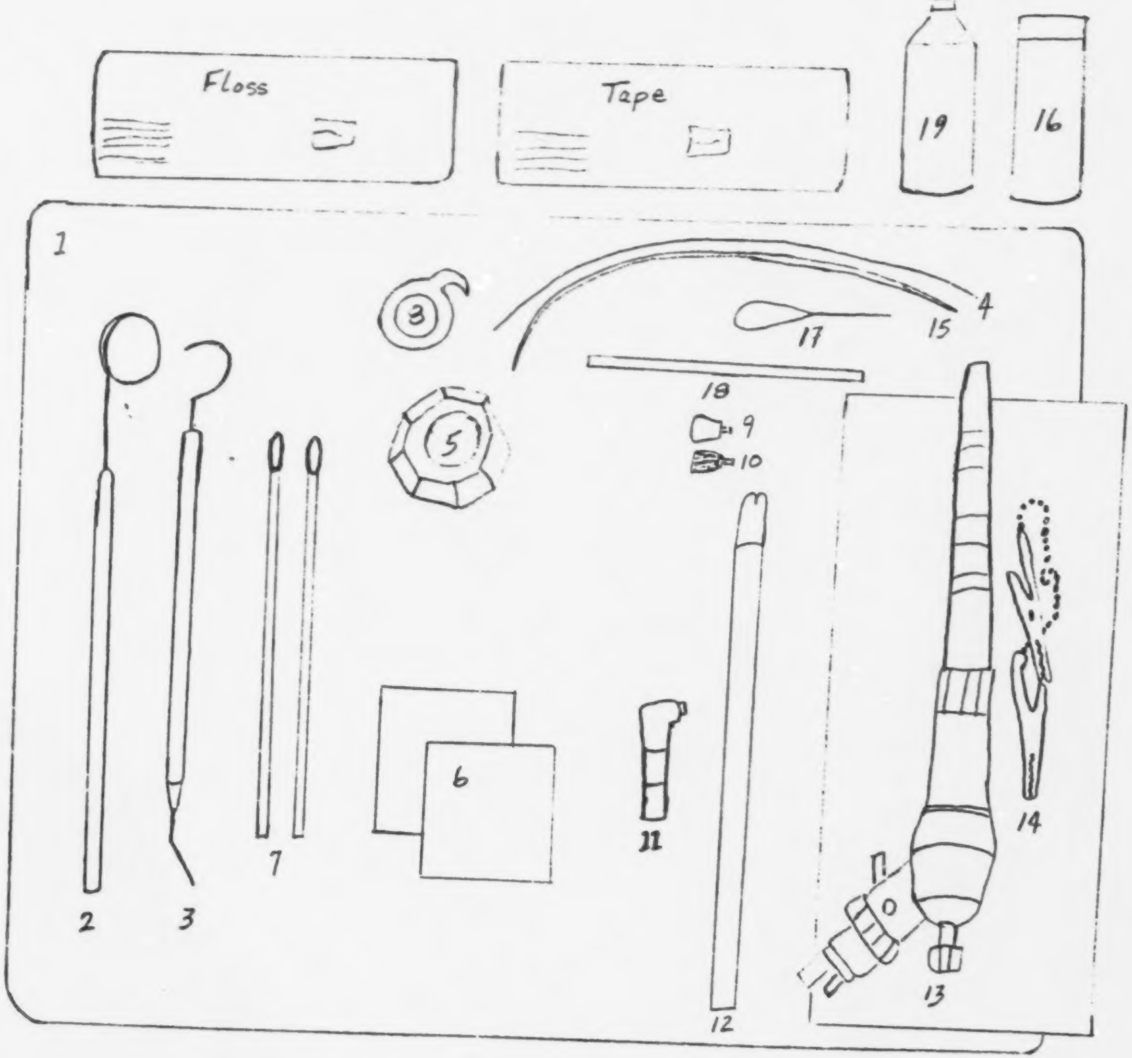
VIEW 2

VIEW 3



BEST COPY AVAILABLE

CORONAL POLISH ARMAMENTARIUM


Floss
Tape
19
16
1
3
5
4
15
17
18
9
10
2
3
7
6
11
12
13
14

Following is an explanation of each component of the armamentarium for coronal polishing.

The mouth mirror is used for retraction of the lip, tongue, or cheek, indirect vision, and to reflect light onto the working (operative) area. A front surface mirror will generally provide a clearer image. It should be sterilized before and after use.

The explorer is used to help determine if stains present are intrinsic, extrinsic or attached to calcified deposits and to determine whether all deposits have been completely removed. It should have a fine, flexible tip which allows maximum tactile sensitivity. It should be sterilized before and after use.

The handpiece is used to hold the prophylaxis angle with its various polishing attachments. It is attached to the dental unit before beginning the polishing procedure. A handpiece which runs at a relatively slow speed is recommended. The speed of the handpiece is critical for minimizing frictional heat and ensuring effective polishing. The handpiece should be operated at the slowest speed possible that moves the prophylaxis cup or brush against the tooth without stalling. Sound also provides a clue for determining whether a cup is rotating too rapidly. A high whine or whistle in the handpiece usually indicates excessive speed. Some handpieces have an adjustable speed changer. This should be set at the slowest speed. Review the instructions for the handpiece you have if you are in doubt about its operation.

The handpiece must be carefully cleaned and lubricated according to the manufacturer's directions. Use of an autoclavable handpiece is recommended and it must be sterilized before and after use. If the handpiece is not autoclavable, it must be disinfected before and after use. Any adherent material (blood, debris) should be removed and then thoroughly wiped with absorbent material saturated with a chemical germicide that is registered with the EPA as a "hospital disinfectant" and is mycobatericidal at use dilution. The disinfecting solution should remain in contact with the handpiece for a time specified by the disinfectant's manufacturer.

The prophylaxis angle is the attachment for the handpiece to which the rubber cup or the prophylaxis brush are attached. It is often referred to as a prophy angle or right angle. The prophy angle may be a right angle screw-on variety or a right angle snap-on variety. The screw-on type prophy angle has a threaded hole into which the attachments are placed. The snap-on type prophy angle has a small button-shaped protrusion at the head on which the polishing attachments are placed. If desired, a button-shaped adaptor may be screwed into the screw-type prophy angle head so that snap-on polishing attachments may be used. When selecting the attachments for the prophy angle, be sure to select ones designed to fit the chosen prophy angle.

If using screw-on attachments, be sure the rotation of the handpiece is adjusted so the polishing attachments (i.e., cups and brushes) rotate in the direction that will keep them on rather than screw them off.

The prophy angle must be carefully cleaned and lubricated according to the manufacturer's directions. Autoclavable prophy angles are recommended and they should be autoclaved after use. If the prophylaxis angle is not autoclavable it must be sanitized before and after use. Disposable prophy angles are also available.

The rubber prophy cup is used to clean the labial, lingual, and buccal surfaces of the teeth and as far into the proximal surfaces as possible. Its effectiveness is limited on the occlusal surface because it does not extend into the pits and groves.

The prophy cup should be soft and flexible enough to readily adapt to the contours of the teeth and to flex under the gingival margin.

Prophylaxis cups come in a variety of sizes. Size selection is dependent on the size of the dentition being polished. The cup should be small enough to easily adapt to the contours of the teeth particularly at the gingival margin. Generally, two sizes meet the needs for coronal polishing (pedodontic size cups and regular or adult size cups).

If two abrasive agents of different abrasiveness are used, it is recommended that two cups be included in the armamentarium to prevent altering the abrasiveness of either agent.

The rubber prophy cup is screwed-on or snapped on to the prophy angle prior to beginning the coronal polish procedure. The prophy cup should be autoclaved before use and discarded after each use.

The prophy brush is used to remove stain and soft deposits from the occlusal surfaces of the posterior teeth. It may also be used (with extreme caution after polishing technique has been perfected) to clean deep developmental grooves on the lingual surfaces of the anterior teeth. The brush should not be used at the gingival one-third of the buccal or lingual surfaces of the teeth as it could cause severe damage to the gingiva or soft tissue it contacts.

The brush selected for coronal polish may have a flat or tapered cut. The diameter of the bristles of the brush should be such that the bristles are flexible enough and small enough to adapt to all of the occlusal pits and fissures. If the brush is too stiff, it may be soaked in hot water to increase its flexibility.

The brush is left on the tray until polishing with the rubber cup is completed, then it is attached to the prophy angle. The brush is autoclaved before use and discarded after each patient use.

The abrasive agent is the material applied to the tooth with the rubber cup, prophy brush, or dental tape which removes the stains or soft deposits, leaving a clean tooth surface. The definition of an abrasive is: A material composed of particles of sufficient hardness and sharpness to cut or scratch a softer material when drawn across its surface. An abrasive agent causes abrasion, the wearing away of surface material by friction. Marked or severe abrasion would be destructive to the tooth surface. Polishing is the production, especially by friction, of a smooth, glossy, mirror-like surface that reflects light. A very fine agent is used for polishing after a coarser agent is used for cleaning.

The type of abrasive agent selected for a particular patient is determined by 1) the type of surface being polished, e.g., enamel, exposed root surface (cementum, dentin), restorative materials; and, 2) the type and amount of stain and soft deposit that must be removed with coronal polishing.

The abrasive agent(s) used in coronal polishing should be just coarse enough to remove stains and soft deposits by abrasion without removing tooth structure unnecessarily, abrading gingival tissue or producing excessive frictional heat. If the abrasive agent selected does not also function as a polishing agent, the abrasive agent should be followed with a polishing agent.

You may choose a commercially prepared abrasive agent or a dry abrasive agent you moisten or lubricate yourself. Commercially prepared abrasives frequently contain pumice or silicon dioxide as the abrasive agent. These agents are generally available in a variety of grits or particle sizes, e.g., coarse, medium, fine, extra fine or supra-fine. The other ingredients of commercially prepared prophylaxis pastes are: 1) Humectants which function to stabilize the ingredients and retain the moisture; glycerin or sorbitol are generally used; 2) Binding agents to prevent separation and splatter; 3) Sweetener which is artificial and non-carcinogenic; 4) Flavoring agent; and, 5) coloring agent.

Abrasive agents which are commonly used for coronal polishing are: 1) pumice, 2) super-fine Silex (silicon dioxide), 3) Zirconium silicate (brand name Zircate), 4) Calcium carbonate (whiting, calcite, chalk).

Pumice is available in the following particle sizes or grits, pumice flour or super-fine which is the least abrasive and may be used to remove stains and soft deposits from the teeth, fine pumice which is mildly abrasive and can be used for stain that is more difficult to remove, and coarse pumice which should not be used on the tooth surface.

Silex or **silicon dioxide** is available in supra-fine which can be used on the tooth surface and xxx Silex that is fairly abrasive.

Zirconium silicate (brand name Zircate) is both a cleaning and a polishing agent. It's abrasive particles lose their projections during use as a cleansing agent and will then act as a fine polishing agent. It may be used on enamel as well as root surfaces (cementum and exposed dentin) and metallic restorations, including gold.

Calcium carbonate (whiting, calcite, chalk) is available in various grades which are used for different polishing techniques. Calcium carbonate or whiting is a polishing agent rather than abrasive agent.

Tin oxide (putty powder, stannic oxide) is another polishing agent which can be used for teeth or metallic restorations. Tin oxide, however, is more frequently used for amalgam polishing procedures rather than for polishing all tooth surfaces because of its distasteful metallic taste.

Preparation of dry abrasive agents for use in coronal polishing involves mixing the abrasive with water, mouthwash, or glycerin. Glycerin is used as a spreading agent and to prevent splatter as well as being a wetting agent. The consistency of the paste produced should be as moist as possible, but transportable from the finger cup or dappen dish to the patient's mouth. If the paste is too moist a 2 x 2 gauze wipe may be used to absorb the excess moisture. If the paste gets too dry, water or mouthwash may be added.

Fluoride prophylaxis pastes are also available. Research studies, to date, have not been consistent in their results on the benefits of topical fluoride applied via prophylaxis paste. Some of the limitations of fluoride prophylaxis pastes include incompatibility of the fluoride with the abrasive agent or other ingredients of the prophylaxis paste. This can result in decreasing the shelf-life or neutralizing the fluoride. Another limitation is that certain abrasives can remove a thin layer of enamel during polishing. With the removal of enamel, the outer layer of fluoride is also removed, possibly as rapidly as fluoride is added to the enamel from the fluoride paste. Because of insufficient and inconsistent research, use of fluoride containing prophylaxis paste is not contra-indicated, but at the present time, it should not be used to take the place of the professionally applied topical fluoride.

There are a variety of abrasive agents and commercially prepared prophylaxis pastes. It is recommended that you refer to the ADA recommendations published in the book Accepted Dental Therapeutics for recommendations and instructions for use when attempting to make a decision about an unfamiliar polishing agent.

The rate of abrasion during coronal polishing is not only determined by the abrasive agent used but is also determined by the manner in which the abrasive agent is applied to the tooth surface, e.g., the quantity applied, the speed of application, and the pressure of application.

The more particles applied per unit of time, the faster the rate of abrasion. Abrasive particles should be moistened with water, mouthwash, glycerin or other vehicle to decrease the number of abrasive particles applied to an area of the tooth surface and thereby decrease the rate of abrasion and reduce the amount of frictional heat produced. Reducing frictional heat is important since heat can damage the dental pulp. Moistening the abrasive agent also facilitates the movement of the abrasive particles across the tooth surface thereby reducing frictional heat production. Use of dry abrasive agents is contra-indicated for coronal polishing because of the increased frictional heat that is produced by dry agents which increases the potential of thermal injury to the dental pulp.

The greater the speed of application of abrasive particles, the faster the rate of abrasion. The amount of frictional heat produced is also increased.

Pressure of application of the abrasive particles also affects the rate of abrasion. The greater the pressure applied against the tooth the faster the rate of abrasion. Abrasive particles to which pressure is applied produce deep grooves in the tooth surface at first, but fracture according to their impact strength and may disintegrate. Heavy pressure, however, is contra-indicated because it increases the production of frictional heat.

The following should be observed when applying abrasive agents during coronal polishing. Wet agents should be used, low speed should be used, and the abrasive particles should be applied with a light, intermittent stroke.

The abrasive agent should be kept uncontaminated from disease carrying microorganisms. They should also be uncontaminated by other grades or types of abrasives unless deliberately mixed. Unused abrasive or polishing agents should be discarded after coronal polishing a patient.

Dental tape and floss made of spun silk or nylon thread. Tape is flat like a ribbon and floss is round. Tape usually has a wax coating. Floss may be waxed, slightly-waxed or unwaxed. The wax coating affords some protection for the tissues, facilitates movement of the floss or tape, prevents excessive absorption of moisture, and helps to prevent shredding. A 12-18 " piece of dental tape and dental floss should be placed on the tray.

Dental tape is used for polishing proximal tooth surfaces and the gingival surface of fixed partial dentures.

Dental floss is used for removing debris and food particles, particles of polishing agents at completion of polishing procedures from interproximal areas, gingival sulci and gingival surfaces of fixed partial dentures, and removal of abrasive particles after use of finishing strips.

Waxed dental tape or unwaxed/waxed floss may be used for coronal polishing. Research has shown that the wax coating of tape or floss does not inhibit fluoride uptake by the tooth surface. Both tape and floss are discarded after use.

A **cotton swab** is used to apply the disclosing solution to the teeth. Another swab is used to apply lubricant such as vaseline to the patient's lips. Vaseline may be applied prior to application of disclosing solution to prevent staining the patient's lips and is also applied to keep the patient's lips lubricated for increased patient comfort. Cotton swabs should be sterilized prior to use and are discarded after use.

Disclosing solution is used to help you identify plaque and debris on the tooth surface. Disclosing solution may be used to identify plaque which must be removed during coronal polish or by the patient depending on your office philosophy on coronal polishing. It may also be used to evaluate the effectiveness of your polishing technique. A disclosing solution rather than tablets are recommended for coronal polishing since the area of application can be limited. Also, the application can be better controlled rather than relying on the patient's ability to thoroughly chew the tablet and swish the disclosant mixed with saliva to effectively color the plaque. Disclosing solutions should be prepared and used according to the manufacturer's directions. Some solutions need to be diluted. Discard all solutions placed on the tray after use.

A discussion of the types of disclosing solutions available is not within the scope of this module. It is expected that you are familiar with the various types of disclosing solutions used in dentistry and know the indications and contra-indications for use of the type available to you.

The **2 x 2 gauze sponges** will be used as a wipe to remove pumice and saliva from the rubber cup or brush before refilling with abrasive agent to prevent splattering and maintain the desired consistency of the prophylaxis paste. A gauze sponge may also be used to stabilize the finger cup on the thumb or index finger. The 2 x 2 gauze is folded in half and placed on the index finger or thumb and the prophy cup is placed over the 2 x 2. The third use of a 2 x 2 gauze during coronal polishing is for drying the teeth to prevent slippage of your fulcrum finger.

The saliva ejector is used to control moisture and debris during the coronal polish. Disposable saliva ejectors are recommended. They are discarded after each patient. If the saliva ejector is metal, it should be cleaned and sterilized after use.

Pumice and saliva tend to clog up the saliva ejector system so it is recommended that water be run through the system after each coronal polish and at the end of the day a mild detergent solution should be run through the saliva ejector system. The saliva ejector is placed in the dental unit hookup before beginning the coronal polish.

The vacuum tip rather than the saliva ejector may be used to remove saliva and debris from the patient's mouth during and after the coronal polish. One precaution is that a vacuum hook-up system with plastic parts may become stained by disclosing solution, so you may want to use the saliva ejector rather than the vacuum system for this reason. Vacuum tips are available in metal and plastic. The plastic tips come in autoclavable and non-autoclavable types. Use of metal or autoclavable type is recommended and they should be cleaned and sterilized after use. If non-autoclavable plastic tips are used, they must be cleaned and properly disinfected. To help prevent sealing against the soft tissues of the patient's mouth when used, drill several small holes in the tip with a bur designed for laboratory use.

The vacuum tip is placed in the vacuum hose of the dental unit prior to beginning the coronal polish.

Bridge/Floss threads should be included in the armamentarium when they will be needed for a fixed bridge or orthodontic appliances. There are a variety of bridge or floss threaders and any of the types may be used. A small, narrow, flexible threader will generally be easier to use under the pontic without causing tissue trauma or patient discomfort. It should be as sanitary as possible when removed from the storage area and is discarded after use.

Abrasive polishing strips or finishing strips should be included in the armamentarium when stain is present on the proximal surfaces of anterior teeth. Finishing strips are made of linen or plastic with one smooth side and one side that has abrasive particles bonded to it. "Gapped" strips are available with an abrasive-free portion to permit sliding the strip through the contact area without abrading the enamel. Finishing strips are available in extra narrow, narrow, medium, and wide widths and extra fine, fine, medium, or coarse grit. Only extra narrow or narrow strips with extra fine or fine grit are suggested for stain removal and only with discretion. They are used for stain removal on the proximal surfaces of only anterior teeth and only when other polishing techniques are unsuccessful. Use of the finishing strip should be limited to use on the enamel surface. It should be used with caution as the edge of the strip is sharp and may lacerate the gingival tissue or lip. Caution should also be used to prevent creating a loose contact area. The abrasive side is capable of removing tooth structure and may make nicks or grooves in the cementum. A six to eight inch length strip is generally appropriate. Strips should be as sanitary as possible when removed from the storage area and are discarded after use.

A lip lubricant such as vaseline should be a part of the armamentarium. It may be applied before, during, or after the coronal polish to keep the lips lubricated and for patient comfort. Vaseline should be applied prior to applying disclosing solution to prevent staining the lips. To prevent cross-contamination, the lubricant can be placed on a 2 x 2 gauze sponge then from there the lubricant can be placed on the end of a cotton swab and applied to the patient's lips.

The patient bib and chain are used to help protect the patient's clothing during this procedure. The bib is placed on the patient as soon as the patient is comfortably seated in the dental chair. The bib is not to be used to wipe instruments with or as a resting place for instruments. The patient bib must be as sanitary as possible when it comes from the storage area and is discarded after use. The chain should be sterilized or disinfected.

A waste container (i.e., cup or sack) should be placed close to the instrument tray for use during the procedure to be used for disposal of used gauze sponges, dental tape and floss, etc.

A facial tissue should be given to each patient for his/her personal use during the procedure. Women should be asked to remove their lipstick, if applicable, with the tissue prior to the procedure to prevent smearing it.

3% hydrogen peroxide solution should be available for use when green stain is present. Green stain is produced by chromogenic bacteria and fungi and decomposed hemoglobin. It is more readily removed when hydrogen peroxide is applied to it before polishing the area. The hydrogen peroxide is prepared for use by diluting a small portion of it in an equal volume of water in a dappen dish. It is applied to the green stain with a cotton swab or small cotton pellet. The unused portion of the solution is discarded.

Summary:

1. Collect the coronal polish armamentarium.
2. Select the abrasive agents, disclosing solution and any additional armamentarium needed for specific patient conditions.
3. Prepare each component of the armamentarium as described.
4. Use suitable aseptic procedure for each component of the armamentarium before and after use.

ASEPTIC TECHNIQUE

Prevention of disease transmission by careful attention to aseptic technique before, during and after coronal polishing is required, as it is for all intra-oral procedures. Infection control guidelines for dental offices which have been published by the Center of Disease Control should be followed. Personal protection and barrier protection measures should be followed (e.g., gloves, mask, protective eye wear and lab coat). Cross-contamination should be avoided. Do not touch instruments, areas which have not been sterilized or disinfected, practice proper hand washing techniques, properly clean, sanitize, disinfect or sterilize all instruments and equipment.

During coronal polishing, the patient's eyes should be protected by either providing a shield (e.g., glasses or towel) or by having the patient close his/her eyes.

The patient treatment area should be clean and orderly and as sanitary as possible before, during, and after use. The laboratory area used for preclinical practice in coronal polishing should also be kept as clean, orderly, and sanitary as possible.

All products used should be as sanitary as possible. Dental tape and floss, saliva ejectors, abrasive agents, disclosing agents, lip lubricant, patient bib, bridge threaders, polishing strips are considered sanitary when taken from the manufacturers container. Cotton swabs and 2 x 2 gauze sponges are generally labeled as sterile or non-sterile from the manufacturer. If non-sterile ones are purchased, they should be sterilized at the office.

Any item placed on the patient's tray and not used is discarded unless it can be sterilized before returning to storage (e.g., 2x2 gauze sponges, cotton swabs).

Summary:

1. Use aseptic technique to prevent disease transmission.
2. Follow the Center for Disease Control guidelines for infection control.
3. Protect the patient's eye during coronal polish.
4. Keep the operatory or laboratory clean and orderly at all times.
5. Use appropriate maintenance procedures for the components of the armamentarium.

STUDY QUESTIONS #1

1. Why must the patient's condition be evaluated before, during and after the coronal polish procedure?

2. Allergic responses, though rare, might be related to which components of the coronal polish armamentarium?

   a.

   b.

   c.

3. Describe the procedure for using 3% hydrogen peroxide for removing green stain.

4. What information should the patient be told about the coronal polish procedure?

   a.

   b.

   c.

5. What information should be included in the chart entry after a coronal polish has been completed?

6. T F State laws regulating dental practice including performance of the coronal polish are uniform.

7. T F Morally, you are obligated to request assistance and/or consultation when the procedure requires skills or training beyond your level.

Study Questions #1

8. What is the goal of coronal polishing?

9. Which of the following are functions of the explorer as used in the coronal polish?

   a. used to determine if stains are intrinsic
   b. used to determine if stains are attached to calcified deposits
   c. used to determine if all deposits have been removed
   d. a and c only
   e. all of the above

10. Which surfaces of the teeth are not adequately polished with the rubber prophy cup?

   a. facial
   b. lingual
   c. interproximal
   d. occlusal
   e. b and d
   f. c and d

11. List three criteria to be used when choosing a rubber prophy cup?

   a.______________________________

   b.______________________________

   c.______________________________

12. Define an abrasive agent.

13. Differentiate between abrasion and polishing.

14. What two factors would you consider when choosing an abrasive agent for a particular patient?

   a.______________________________

   b.______________________________

Study Questions #1

15. Write yes or no in each blank to indicate whether or not the listed abrasive agent is appropriate on these surfaces.

Flour or pumice	Zirconium silicate	Tin oxide
Enamel__________	Enamel____________	Enamel__________
Root Surface___	Root Surface______	Root Surface___
Gold___________	Gold______________	Gold___________

16. Why must the abrasive agent be prepared with water or lubricant?

17. Describe the desired consistency of the prepared abrasive agent.

18. What armamentarium is available for checking the surfaces of the teeth for complete removal of deposits upon completion of the coronal polish?

a.

b.

19. List two uses of gauze sponges during the coronal polish procedure:

a.____

b.____

20. Name two devices that can be used to remove moisture and debris from the patient's mouth during coronal polishing.

a.____________________________

b.____________________________

Study Questions #1

21. Abrasive strips are sometimes utilized for coronal polish. Fill in the blank with information appropriate to use of these strips in the coronal polish procedure.

Acceptable width(s):____________________________________

Acceptable grit(s):_____________________________________

Appropriate tooth surfaces:______________________________

22. What agent is effective in removing green stain?

23. List three precautions that can be taken to maintain operator safety.

a.____

b.____

c.____

24. T F Items placed on the patient tray need to be sterilized or disposed of only if they have directly contacted the patient's mouth.

25. T F A handpiece which provides a relatively high speed is recommended for coronal polish because it allows for easier removal of deposits.

26. T F If fluoride is to be applied following the coronal polish, it makes no difference whether waxed or unwaxed floss is used for polishing proximal tooth surfaces.

ANSWERS TO STUDY QUESTIONS

1. Why must the patient's condition be evaluated before, during and after the coronal polish procedure?

   It will allow you to make sound clinical judgments about the care and service you provide the patient. You will be able to determine whether there are:
   1. contra-indications to treatment; and,
   2. conditions requiring modifications in treatment procedure.

2. Allergic responses, though rare, might be related to which components of the coronal polish armamentarium?

   a. abrasive agent
   b. disclosing solution
   c. lip lubricants

3. Describe the procedure for using 3% hydrogen peroxide for removing green stain.

   Prepare a solution of 3% hydrogen peroxide diluted in equal amounts of water in dappen dish. Apply solution to the stained areas with cotton swab. Leave solution in place 10-20 seconds and rinse away thoroughly. Then polish normally. Avoid applying peroxide directly onto gingiva.

4. What information should the patient be told about the coronal polish procedure?

   a. the reasons why coronal polish is done
   b. general sequence of procedures to be used
   c. a description of any sensation he/she might experience during the procedure

5. What information should be included in the chart entry after a coronal polish has been completed?

   Statement about coronal polish and description of all procedures accomplished at the appointment. All entries in ink with signature and date.

6. T [✓ F] State laws regulating dental practice including performance of the coronal polish is uniform.

7. [✓ T] F Morally, you are obligated to request assistance and/or consultation when the procedure requires skills or training beyond your level.

8. What is the goal of coronal polishing?

   To remove stains, film, and dental plaque after all hard deposits are removed from the teeth.

   Rationale: A coronal polish is done to provide a smooth, shiny tooth surface which:
   a. resists accumulation of new deposits
   b. makes the teeth easier for the patient to keep clean
   c. enhances the appearance of the teeth
   d. aids in motivating the patient to take care of his/her teeth since he will be able to recognize the appearance and feeling of a clean mouth.

9. Which of the following are functions of the explorer as used in the coronal polish:

   e. All of the above: the explorer is used to determine if the stains are intrinsic, extrinsic or attached to calcified deposits and to help determine when all deposits have been completely removed.

10. Which surfaces of the teeth are not adequately polished with the rubber prophy cup?

    f. interproximal, occlusal

11. List three criteria to be used when choosing a rubber prophy cup.

    a. soft
    b. flexible
    c. size
    d. not frayed

12. Define an abrasive agent.

    A material composed of particles of sufficient hardness and sharpness to cut or scratch a softer material when drawn across its surface.

13. Differentiate between abrasion and polishing.

    Abrasion is the wearing away of surface material by friction. Polishing is the production, especially by friction, of a smooth, glossy, mirror-like surface that reflects light.

Study Questions #1 - Answers

14. What two factors would you consider when choosing an abrasive agent for a particular patient?

    a. type of surface being polished
    b. type and amount of stain and soft deposits that must be removed.

15. Write yes or no in each blank to indicate whether or not the listed abrasive agent is appropriate on these surfaces.

Flour or pumice	Zirconium silicate	Tin oxide
Enamel - yes	Enamel - yes	Enamel - yes
Root Surface - no	Root Surface - yes	Root Surface-yes
Gold - no	Gold - yes	Gold - yes

16. Why must the abrasive agent be prepared with water or lubricant?

    To facilitate particle movement across the tooth surface thereby reducing the frictional heat produced.

17. Describe the desired consistency of the prepared abrasive agent.

    As moist as possible yet easily transportable between the prophy cup ring and the teeth with whatever polishing device is being used.

18. What armamentarium is available for checking the surfaces of the teeth for complete removal of deposits upon completion of the coronal polish?

    a. disclosing solution
    b. explorer
    c. air syringe (not specifically mentioned in armamentarium)

19. List two uses of gauze sponges during the coronal polish procedure:

    a. as a wipe to remove pumice and saliva from the rubber cup or brush
    b. to stabilize the prophy finger cup on the index finger.

Study Questions #1 - Answers

20. Name two devices that can be used to remove moisture and debris from the patient's mouth during coronal polish.

    a. saliva ejector
    b. vacuum tip

21. Abrasive strips are sometimes utilized for coronal polish. Fill in the blanks with information appropriate to use of these strips in the coronal polish procedure.

    Acceptable width(s): extra narrow or narrow
    Acceptable grit(s): fine or extra fine
    Appropriate tooth surfaces: interproximals on enamel of anterior teeth

22. What agent is effective in removing green stain?

    3% hydrogen peroxide diluted

23. List three precautions that can be taken to maintain operator safety.

    a. wear safety glasses
    b. wear gloves
    c. wear masks

24. T [✓ F] Items placed on the patient tray need to be sterilized or disposed of only if they have directly contacted the patient's mouth.

25. T [✓ F] A handpiece which provides a relatively high speed is recommended for coronal polish because it allows for easier removal of deposits.

26. [✓ T] F If fluoride is to be applied following the coronal polish, it makes no difference whether waxed or unwaxed floss is used for polishing proximal tooth surfaces.

CORONAL POLISH PROCEDURE

This section of the module describes the techniques for performing a coronal polish.

Sequence of Procedures:

The sequence of procedures used when performing a coronal polish on a patient is more involved than the laboratory coronal polish sequence. Coronal polish on a patient involves careful evaluation of the patient's psychological, medical, and dental condition prior to and during the procedure. Some of the important considerations in patient care and management are discussed in this section, while others were discussed in more detail in the section on Patient Care and Management.

The general sequence of events for coronal polish as a lab exercise and as a patient procedure is listed below for easy comparison.

Lab Procedure	Patient Procedure
	1. Read patient chart and review medical/dental history and oral examination forms.
1. Prepare and set up armamentarium.	2. Prepare and set up armamentarium.
2. Prepare dentoform for lab exercises by marking it with a lead pencil.	3. Prepare patient for treatment (seat and place patient bib; explain procedure).
	4. Review medical/dental history with patient. (Record any significant changes since previous appointment.)
	5. Perform general appraisal and oral inspection.
	6. Determine type and extent of deposits on the teeth by visual and tactile examination.

3. Polish the buccal and lingual surfaces with the rubber cup and abrasive, working as far inter-proximally as possible (toothpaste may be used to minimize the amount of splatter).

4. Polish occlusal surfaces with brush and abrasive.

5. Rinse and evacuate all polishing agent and debris.

7. Have qualified dental hygienist or dentist remove all hard deposits, if present.

8. If your office philosophy is selective polishing, disclose to identify the areas of plaque and work with the patient on an effective technique of removing the plaque.

9. Polish buccal and lingual surfaces exhibiting stain with the rubber cup and abrasive; OR, if your office philosophy is to polish all teeth, polish all buccal and lingual surfaces with rubber cup and abrasive, working as far inter-proximally as possible.

10. Polish occlusal surfaces with stain with brush and abrasive; OR, Polish all occlusal surfaces (posterior teeth) with brush and abrasive.

11. Rinse and evacuate all polishing agent and debris. Frequency of evacuation will vary from patient to patient.

6. Polish all inter-proximals with abrasive using dental tape.	12. Polish inter-proximals which exhibit stain with abrasive using dental tape. If the abrasive with dental tape is ineffective in removing the stain and the stain is on the anterior teeth, you may use abrasive polishing strip; OR, Polish all inter-proximals with abrasive using dental tape. If stain is present on anterior teeth and abrasive with tape is ineffective, you may use an abrasive polishing strip.
7. Rinse and evacuate thoroughly.	13. Rinse and evaluate thoroughly.
8. Floss all inter-proximals to remove abrasive particles.	14. Floss all inter-proximals to remove abrasive particles.
9. Rinse and evaluate thoroughly.	15. Rinse and evacuate thoroughly.
10. Dry teeth with air.	16. Dry teeth with air.
	17. Apply disclosing solution to all tooth surfaces.
11. Evaluate polish.	18. Evaluate polish.
12. Re-polish any areas missed.	19. Re-polish any areas missed.
13. Re-evaluate polish.	20. Polish or have polished any removable appliances.
	21. Have dentist/supervisor evaluate final product before dismissing the patient.
	22. Write up patient chart.
14. Clean up lab area and armamentarium.	23. Clean up treatment area and armamentarium.

Additional considerations for patient procedure:

1. Saliva ejector or vacuum tip may be used periodically throughout the polishing procedure to remove saliva and debris. Frequency will vary from patient to patient.
2. An additional step may be indicated between #19 and #20 if the abrasive agent selected needs to be followed by a less abrasive agent or a polishing agent.

Patient Operator Position:

It is assumed that you are already familiar with the requirements for satisfactory patient/operator position. However, the important factors will be reviewed since both you and the patient should be comfortably seated in order to increase the ease and efficiency with which the coronal polish is accomplished.

First, it is important for the operator stool to be at the proper height for the operator. This height is such that the upper and lower leg form a right angle (90°) at the knee. Your body weight should be completely supported by the chair (avoid sitting on the edge of the chair).

When the patient is positioned in the supine to semi-supine position, the following positions should be evaluated. The patient's mouth should be at approximately the level of your elbow when you are both seated (measure this level when your arm is hanging beside your body). This will allow you to work comfortably with your back straight and your arms in a position which minimizes strain. If the patient is too high, you must raise your arms to reach into the mouth and this can be very fatiguing. If the patient is too low, you will have to bend over to work and this can be very tiring.

It is recommended that when working on the maxillary teeth, the back of the chair be positioned parallel to the floor and the patient be requested to tilt the head so the occlusal plane of the maxillary teeth are perpendicular (at a 90° or right angle to the floor). Then, when working on the mandibular teeth, the back of the chair is raised to a position of approximately a 20° angle to the floor and the patient instructed to tip the head so the occlusal plane of the mandibular teeth is parallel to the floor. The patient's head can be tilted toward you or away from you. A good rule of thumb is to request that the patient turn the head slightly away from you when you are working on the tooth surface which is facing you and have the patient turn the head toward you when you are working on the tooth surface which is away from you (e.g., buccal of maxillary or mandibular right, lingual of maxillary or mandibular left)--patient turns head away from you. Lingual of maxillary or mandibular right and buccal of maxillary or mandibular left--patient turns head toward you.

Access and visibility of the buccal aspect of the maxillary posteriors is frequently difficult. A helpful technique for this area is to have the patient slide the lower jaw toward the side you are polishing and open approximately half way. Sometimes access to the buccal aspect of mandibular molars is hampered by the patient opening too wide which decreases the space between the tooth and cheek.

For patient comfort and to assist in maintaining aseptic technique, ask the patient to make the changes in their head position, rather than touching the face or head to move it. Also, to maximize patient comfort and minimize disease transmission, you should try to keep your face 14-16 inches from the patient's face.

Your position will vary from an 8:00-12:00 o'clock position if you are right-handed, and if you are left handed a 4:00-12:00 o'clock position. Your position will depend on which area of the mouth you are polishing and which position affords optimal visibility and accessibility. It is suggested that in your early training you work from 8:00-11:00 o'clock if right handed; 4:00-1:00 o'clock if left-handed while working on the facial surfaces of the anterior teeth and from 12:00 o'clock when polishing the lingual of the maxillary and mandibular anterior teeth. Experience will help you decide which positions are the most comfortable and which give the best visibility and accessibility.

Position all equipment and armamentarium as close and convenient as possible to reduce reaching distance and maximize efficiency.

Grasp/Fulcrum:

All instruments and the handpiece with prophy angle attached are held with a modified pen grasp while performing coronal polish procedures. A modified pen grasp is placing the index finger and thumb opposite each other on the handle of the instrument or handpiece with the pad of middle finger placed on the shank of the instrument. On the handpiece, the pad of the middle finger is placed on the prophy angle at a distance from the polishing end that allows you the greatest control and balance of the handpiece. When possible, the handpiece should rest against your hand for balance and to help minimize operator fatigue from the weight of the handpiece. Your hand size will affect the exact positioning of your fingers but remember to use the pad of the third finger on the instrument, not the side of the finger. Using the pad of the middle finger is critical for providing a secure grasp which will keep the instrument from slipping or rotating unintentionally.

After a secure grasp is established a stable fulcrum must be established to assure complete control of the instrument and handpiece during polishing. The ring finger is used as the fulcrum finger when using the modified pen grasp. The purpose of a fulcrum while using dental instruments or the handpiece is to provide a pivot point for the hand in order to move the instrument or handpiece to adapt them to the contours of the teeth.

The fulcrum must be established on a stable surface. Whenever possible, the fulcrum should be on tooth-structure (e.g., occlusal or incisal surfaces or embrasure areas of facial or lingual surfaces of the teeth). Placement of the fulcrum finger on the direct labial or lingual surfaces is not recommended as these surfaces are generally slippery, so do not provide a stable fulcrum. Soft tissue such as lips, cheeks and chin also do not provide a stable fulcrum. Additionally, pressure is applied when fulcruming and this may pinch or bruise the tissue. Placing the fulcrum on the lips, cheeks, and chin is also not recommended because aseptic technique is not maintained. Mobile or sensitive teeth should be avoided as a fulcrum area because of the pressure which must be applied against them when fulcruming.

Sometimes, suitable tooth structure is not available for a secure fulcrum (e.g., only missing, mobile, or sensitive teeth are present in the fulcrum area). When these situations occur, it may be helpful to place a finger of the opposite hand against the alveolar ridge or in the vestibule and fulcrum on your finger.

There may be times when fulcruming on soft tissue cannot be avoided. In these cases, it is advised that the soft tissue have a firm base (e.g., alveolar ridge, chin) and you should dry the tissue with a 2 x 2 gauze or compressed air to prevent slippage of the fulcrum finger. You should also place your fulcrum finger so the fingernail of your fulcrum finger does not cause patient discomfort.

A proper grasp and a stable fulcrum are important during coronal polishing for stability and controlled action of the handpiece or instrument. This will enhance patient comfort and confidence in the operator's ability to manipulate the instrument and decrease the risk of injuring the patient's soft tissue.

Use of Mirror/Explorer:

The mouth mirror and explorer are used for the detection of stain and deposits before, during and after coronal polishing.

It is assumed that you know how to clinically identify stains, deposits, tooth structure, and restorations through visual and tactile sense. When you are in doubt about the nature of the stain or deposit present on the teeth you are about to polish, consult with your instructor, dentist or hygienist. When you discover deposits which must be scaled off, it is your responsibility to have these deposits removed by a qualified person (i.e., dentist or dental hygienist).

The mirror is used for indirect vision, indirect illumination, or retraction during coronal polishing. The mirror is used for indirect vision to view teeth or other intra-oral surfaces which are difficult or impossible to view directly. You position the mirror to see the reflection of the tooth or structure in the mirror. Indirect vision is very useful when working on the lingual surfaces of the teeth and in the most posterior areas of the mouth. You will find that by angulating the mirror, that is, by turning and tilting the mirror, even very inaccessible areas can be easily seen.

It is important that you learn to use a mouth mirror for indirect vision so you can see where you are working with each polishing instrument. This will help prevent damage to the soft tissue. It will also help you evaluate whether or not you are removing the stain and deposit with your polishing technique. If you have difficulty using the mouth mirror during coronal polish, consult your instructor.

Using the mouth mirror, for indirect illumination, is very advantageous for areas where you cannot direct sufficient light for good vision. To use the mouth mirror for indirect illumination, adjust the dental unit light to provide the best illumination possible in the area, then position the mouth mirror so that it will catch and reflect light directly onto the surfaces you want to see.

The mouth mirror is also used for retraction of the lip, cheeks or tongue to increase your view of the areas in which you are working.

When using the mouth mirror, there are some precautions to consider to prevent patient discomfort. Avoid resting the mouth mirror against the patient's alveolar bone. Also avoid pinching the lip between the mirror handle and the teeth or setting the mirror or mirror handle directly against the teeth. It can also be very uncomfortable for the patient if the mirror-handle is allowed to pull at the coroner of the patient's mouth. To avoid doing this, use the back of the mirror to retract the cheek rather than using the handle to retract the corner of the mouth.

A right-handed operator usually holds the mirror in the left hand to have the right hand free to manipulate other instruments such as the handpiece or explorer. A modified pen grasp and stable fulcrum should be used. Also practice holding the mouth mirror in your left hand throughout the polishing procedure to keep efficiency at a maximum. When the mirror is not being used, palm grasp it with the mirror head by your little finger. **(View the videotape: "Use of the Mouth Mirror"--5:13 minutes.)**

The explorer is used for tactile examination of the clinical crowns of the teeth to help you decide whether stains are intrinsic, extrinsic or are attached to calcified deposits to help you decide if the deposit can be polished off or if it must be scaled off.

The explorer is generally held in the right hand of the right-handed operator. A modified pen grasp and a secure fulcrum should be used. A light touch is used to enhance detection of deposits. The side of the tip of the explorer is positioned against the tooth surface and short controlled strokes are used over the surface being examined. **(View the videotape: "Instrument Grasp, Use of a Fulcrum and Instrument Activation"--6.31 minutes.)**

Use of Handpiece:

The rheostat (foot pedal) activates the dental engine which runs the handpiece and rotates the end of the prophylaxis angle. A steady foot pressure is applied against the rheostat to produce an even, slow speed.

The dental unit will have a pressure gauge to identify the pounds of pressure being used as you run the handpiece. Check where this pressure should be for your particular dental unit and handpiece. Most handpieces run between 10-13 pounds of pressure. If the pounds of pressure is insufficient, there will not be enough torque created to keep the cup or brush running when it is applied against the tooth. The handpiece will stall. The handpiece should be run at the slowest speed possible without the handpiece stopping when the rubber cup or brush is placed against the tooth.

Running the handpiece at higher speeds will increase the frictional heat produced and it is possible to overheat the tooth, causing pulp damage and patient discomfort. At higher speeds, tooth structure may be unnecessarily removed since abrasive agents applied at a high speed cause more abrasion. At high speeds, it is also more difficult to control placement of the handpiece, increasing the risk of inadvertently abrading the soft tissue adjacent to the area you are polishing.

Learn to monitor the speed of the handpiece by its sound. A whining sound of the handpiece is an indicator of a speed that is too fast. It will require a little practice to maintain a constant speed with the handpiece. Once learned, it will save time and energy.

The handpiece is activated after the rubber cup or brush have been placed inside the mouth and just prior to placing them against the tooth. This allows you to adjust the speed before applying the polishing instrument to the tooth and to prevent splattering of the polishing agent. Also, to prevent splattering of the polishing agent, saliva, and debris, release the foot pedal to stop the rotation of the cup or brush if they are to be removed from the tooth surface for more than a moment.

Maintenance of Operative Area:

For the greatest effectiveness and efficiency, the area being polished should be kept dry and an adequate amount of abrasive agent must be used. If a prophy finger cup or prophy paste holder with the abrasive is placed on the index finger or thumb, the prophy paste can be readily carried to the tooth surface. Fill the rubber cup with prophy paste or pick up abrasive on the ends of the bristle brush by placing the cup or brush into the abrasive and slowly engage the foot pedal to fill the rubber cup with abrasive or adhere abrasive to the end of the brush. Wipe the abrasive over the tooth surfaces of the area being polished (surface of 3-4 teeth) then refill the rubber cup with paste when you are ready to move to the next group of teeth.

To prevent splattering of the polishing agent or saliva which adheres to the cup or brush, stop the rotation of the instrument before it is removed from the mouth, and do not engage the handpiece until the cup or brush are next to the tooth surface. Also, wipe the cup or brush frequently to remove saliva or debris. The saliva ejector or vacuum tip may also be used to remove saliva or debris from the cup or brush.

The operating area should be kept free of saliva and excessive polishing agent for better vision, to provide a less slippery surface for fulcruming, and for increased patient comfort. To accomplish this, the saliva ejector or vacuum tip may be used to remove saliva and the abrasive agent and it is desireable to rinse the patient's mouth occassionally to debride the operating area.

Use of the Rubber Cup:

The rubber cup can be used to polish all surfaces of the teeth and fixed appliances with the chosen abrasive agent. It is most efficient on the buccal and lingual tooth surfaces and should be worked as far inter-proximally as possible. When fixed appliances (e.g., bridges) are present, the cup is adapted as far as possible onto the gingival surfaces.

The only portion of the rubber cup that polishes is the edge. Consequently, the edge of the cup must be the portion of the cup which is continually adapted to the area being polished. In order to accomplish this, slight pressure is applied against the tooth to phalange/flex the edge of the cup so more of the edge of the cup touches the tooth surface. The cup is moved either up or sideways and upward to effectively have the edge of the cup with abrasive move over the tooth surface to remove stain or soft deposit. The center of the rubber cup aids only in transporting the abrasive agent to the area being polished and will create a suction effect if the cup is placed flat on the tooth surface.

The polishing movement or stroke using the rubber cup should be short, intermittent, overlapping, with light to medium pressure applied against the tooth surface. The amount of pressure applied is determined by how difficult it is to remove the stain or soft deposit. The stroke can be described as "touch and wipe," "pat and sweep," painting or brush stroke. In other words, the slowly revolving rubber cup is applied to the tooth surface with light to medium pressure to adapt the cup edge, then moved a short distance on the tooth, lifted off, then reapplied in an adjacent area so the next stroke slightly overlaps the last. Short, intermittent light to medium pressure strokes are used to minimize the amount of frictional heat produced. When you encounter stain that is difficult to remove, move to another area, let the tooth cool, then return to polish the area again.

A systematic sequence of polishing each tooth surface ensures all areas will be cleaned. One effective sequence is to begin with the cup placed just above the gingival margin as far onto the mesial or distal proximal surface as possible. Flex the cup by applying slight pressure into the sulcus, then sweep it toward the occlusal or incisal edge without jamming it into the contact. Lift the cup off the tooth at the occlusal or incisal edge and place it near the gingiva in the next stroke. Repeat this process around the buccal or lingual surface of the tooth until the other proximal surface is reached. The occlusal surface can be polished using the rubber cup; however, the rubber cup is less effective than the bristle brush, particularly when the occlusal surface contains definite fissures and grooves. The brush is indicated for use on the occlusal surfaces.

One must be careful to prevent the edge of the cup from abrading the gingival tissue. This abrasion appears as a whitish burned area or a raw bleeding area depending on the severity. Healing takes approximately 7-14 days. Be careful.

In addition to polishing each tooth surface systematically, it is important to develop a sequence for polishing the entire mouth, so all areas will be polished as efficiently as possible. One efficient sequence is to begin on the distal lingual surfaces of the most posterior tooth in the mandibular right quadrant, polish all the lingual surfaces of the teeth around to the most posterior tooth of the lower left, then polish all the buccal surfaces around to the point where you started. The maxillary arch is then polished in the same type of sequence. Whatever sequence you prefer to use is acceptable as long as you establish a definite pattern for routine use.

Use of Bristle Brush:

The occlusal surfaces are more effectively and efficiently cleaned with a soft bristle brush--especially occlusal surfaces without restorations. The bristles of the brush reach into the pits and grooves more effectively than the edge of a rubber cup.

The use of the brush is generally limited to the occlusal surfaces. The brush can also be used, with caution, to polish the lingual pits of maxillary anterior teeth, if necessary. Using it on the other tooth surfaces increases the possibility of lacerating the gingival tissues or causing grooves or scratches in the tooth surface, particularly the roots.

Distribute the abrasive agent on the occlusal surfaces of the teeth to be polished. Establish a stable fulcrum and bring the brush almost in contact with the tooth before engaging the foot pedal. Use a short, brushing stroke beginning in the central fossa of the occlusal and stroking or brushing toward the buccal or lingual tooth surface following the inclined planes of the cusps.

The slowest speed of the handpiece should be used. The mouth mirror or fingers should be used to retract the tongue or cheek to protect them from the revolving brush. **(View video on the "Use of the Prophylaxis Angle and Handpiece," 6:05 minutes).**

Use of Dental Tape:

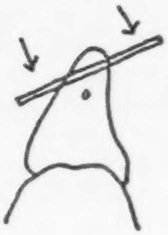
The rubber cup cannot effectively polish the proximal surfaces of the teeth or the gingival surfaces of fixed bridges. Dental tape with the abrasive agent is used to polish these surfaces.

Wipe some polishing abrasive along the buccal surfaces of the teeth with your finger so it can be carried onto the proximal surface with the tape, or wipe the abrasive agent directly onto the tape. If you chose to spread the abrasive directly onto the teeth, do one quadrant or sextant at a time so the abrasive does not dry out before you use it.

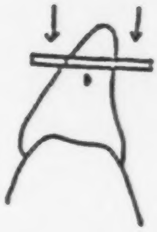
A piece of tape 12"-18" long should be of sufficient length to polish all proximal tooth surfaces. Use the same technique with the tape as used for floss being careful that you polish the entire proximal tooth surface without traumatizing the interdental papilla or free gingival margin.

Hold the tape with the thumb and index finger of each hand. Grasp it firmly with approximately 1/2 inch of tape between the finger tips. The ends of the tape may be tucked into the palm and held by the ring and little finger or the tape may be wrapped around the middle fingers with more tape on one side than on the other. The tape can then be unwound from one middle finger and wound onto the other middle finger so a new piece of tape can be used in each interproximal area.

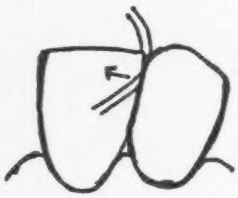
Establish a secure fulcrum for one hand to maximize control. You may use the side of a finger or the thumb for the fulcrum. Position the tape at an oblique angle, then carry the tape through the contact using a short back and forth motion and gentle pressure. This technique will help prevent "snapping" the tape through the contact and injuring the papilla. If the contact is very tight, it may be helpful to apply gentle pressure against the proximal surface of one of the teeth as you work through the contact to open the contact slightly.



A. Tape Oblique
-correct-



B. Tape Horizontal
-incorrect-

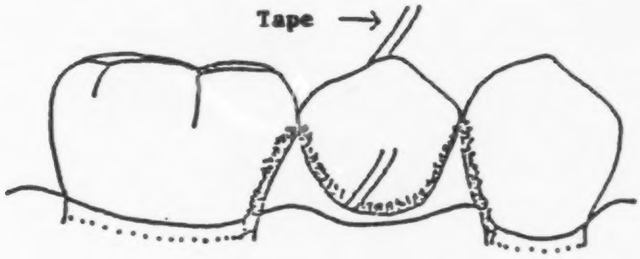


C. Pressure against one tooth to open tight contact.

As the tape is carried through the contact, it is gently pressed against the surface of one of the teeth and wrapped around that tooth to at least cover the line angles. Use an up and down and back and forth motion to polish the entire proximal surface. When one tooth is polished bring the tape over the top of the interdental papilla and adapt it to polish the proximal surface of the adjacent tooth in the same manner as previously described. Remove the tape through the contact or pull it out through the facial embrasure area. The distal of the most posterior teeth or other surfaces which do not have contacting teeth should not be left unpolished.

As you work from tooth to tooth, use a new section of tape in each interproximal. Replenish the polishing agent as needed. After taping, rinse the area thoroughly and evacuate all debris. For patient comfort, it is a good idea to rinse after taping one arch before going on to the next arch.

When there are fixed appliances (e.g., bridges or splints), the gingival surface of the appliance must be polished with abrasive using dental tape. Thread the tape under the appliance at the facial gingival embrasure area using bridge threaders, if necessary. When the threader or tape is pushed through, it is caught on the lingual and the tape is pulled through. Polish with short back and forth motions, employing gentle pressure in an occlusal/incisal direction. Cover the entire gingival surface of the appliance and the proximal surface of the abutment teeth. Rinse thoroughly.



Use of Abrasive Polishing Strips:

Abrasive polishing strips are used only on the proximal surfaces of anteriors and their use is limited to the situations when small areas of stain remain on the proximal surface of anterior teeth after other polishing techniques have been unsuccessful (i.e., rubber cup and dental tape).

Abrasive strips should only be used on enamel because of the roughness of the abrasive particles on the strips.

Abrasive strips are available in extra fine, fine, medium or coarse grit. Only extra narrow or narrow strips with fine or extra fine grit are suggested for stain removal. Selection is based on the space available for use and the type and amount of stain to be removed.

The edge of the strip is sharp and can easily lacerate the soft tissue. Thus, retraction of the lip and tongue and a secure fulcrum are important when using the abrasive strip for stain removal.

A strip no longer than 6 inches is most easily controlled. Establish a well-controlled fulcrum and grasp. Protect the lip by retracting it with the thumb and index finger.

Direct the abrasive side of the strip toward the proximal surface to be treated. Slowly and gently work the strip just through the contact area with a slight sawing motion. If the strip breaks, floss the area to remove the abrasive particles. Press the abrasive side of the strip against the tooth and draw the strip back and forth in a 1/8 inch arch (facial/lingual) 2 or 3 times by rocking or pivoting on the established fulcrum. Caution should be taken to avoid altering the contact area (i.e., loosening or grinding the contact). Remove the strip. Do not attempt to turn the strip while it is in the interdental area. In other words, the strip must be removed and repositioned to polish the adjacent tooth surface, if indicated.

When the interdental papilla is missing so a space is clearly visible through an interproximal area, a narrow finishing strip may be threaded through. The end of the strip may be cut on a diagonal to facilitate threading the strip through the interproximal area.

After polishing with strips, floss the proximal surfaces and rinse thoroughly to remove all abrasive particles.

Use of Dental Floss:

All the teeth should be flossed after polishing to remove any particles of abrasive agent which may remain after rinsing. This will prevent gingival irritation from the abrasive agent.

Evaluation Procedure:

The final result of the coronal polish procedure is the lustrous shine of thoroughly cleaned teeth. Polished enamel has a high gloss which reflects light. All restorations and exposed tooth surfaces should have a glossy appearance as well. All extrinsic stain, plaque, and other debris should no longer be present. The mouth should be free of all abrasive and polishing particles and teeth should be smooth when explored with an explorer. Soft tissue should be free of lacerations or abrasions.

Disclosing solution, the mouth mirror, air, and the dental light should be used to evaluate the results of your polishing procedure.

To apply disclosing solution, first apply vaseline to the patient's lips then dry the teeth thoroughly. Using a cotton swab, apply disclosing solution to the clinical crowns of the teeth (DO NOT apply disclosing solution to the dentoform). Have the patient rinse. Check each tooth carefully using the mouth mirror and compressed air. Make sure the dental light is adjusted for optimal illumination to facilitate your identification of any stain, plaque, or debris remaining on the tooth surface. Re-polish any missed areas.

Evaluation Criteria:

The coronal polish procedure and final product should be carefully evaluated to see that they meet the criteria listed below.

1. The type of stains and deposits will be determined and appropriate removal technique will be instituted (i.e., if calculus is present, a qualified person will remove it).

2. Appropriate polishing agent(s) will be selected according to:
    a. the type and amount of stain to be removed; and,
    b. the restorative materials present in the patient's mouth and will be utilized on the appropriate areas.

3. Auxiliary polishing aids will be used when necessary (i.e., dental floss, dental tape, finishing strips).

4. All handpiece attachments will be used on the portion of the tooth for which they were designed.

5. An efficient sequence for polishing will be utilized.

6. The technique for coronal polish will ensure effectiveness, efficiency, and patient comfort.

7. Modifications in polishing techniques and/or procedures will be made according to special needs of a given patient.

8. The clinical crowns of the teeth will be free of all hard deposits, extreme stain, and soft debris and will be smooth and lustrous.

The checklist on the next page may be used to assist you in the evaluation of coronal polish procedures and the final product. The checklist also provides a good summary of the key points covered in this section of the module.

CORONAL POLISH CHECKLIST

C - Acceptable: Criteria met as stated (2 points)
I - Improvable: moderately effective, needs improvement (1 point)
X - Unacceptable: inefficient, harmful (0 points)

Student________________
Patient________________
Date________________
Instructor________________
Grade%________________

GRASP: **COMMENTS**

☐ 1. Holds handpiece with index finger and thumb pads.
☐ 2. Stabilizes with pad of middle finger.
☐ 3. Supports handpiece weight with hand.
☐ 4. Rotates handpiece to aid adaption.

FULCRUM: **COMMENTS:**

☐ 5. Establishes on stable tooth whenever possible.
☐ 6. Uses third (ring) finger with little finger held close or acting as second fulcrum.
☐ 7. Maintain stable, constant pressure.
☐ 8. Pivots to aid adaptation.
☐ 9. Moves hand up-down, side-side, when pivoting.

STROKE: **COMMENTS:**

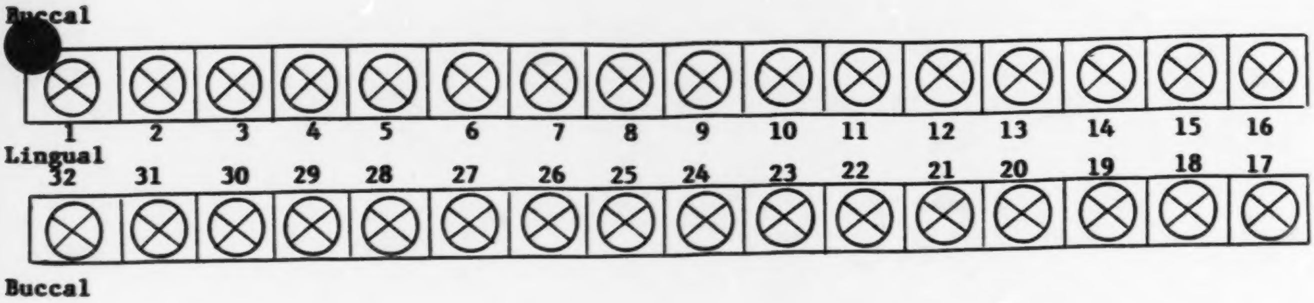
☐ 10. No finger action.
☐ 11. Maintain constant speed (10-13 lbs. pressure).
☐ 12. Uses short strokes.
☐ 13. Uses combination pat/sweep stroke.
☐ 14. Uses overlapping strokes.
☐ 15. Uses light-medium pressure.
☐ 16. Flares edge of cup into sulcular/proximal areas.
☐ 17. Adapts edge of cup to tooth contours.
☐ 18. Adapts brush to occlusal pits and convexities.
☐ 19. Adapts tape/floss to proximal surface.
☐ 20. Uses systematic sequence.

GENERAL POLISH PROCEDURE: **COMMENTS:**

☐ 21. Uses correct abrasive agent for situation.
☐ 22. Debrides cup of saliva before refilling.
☐ 23. Uses auxiliary polishing aids with appropriate technique.
☐ 24. Rinses and evacuates patient's mouth at least once during polish and at completion of procedure.
☐ 25. Evaluates polish with disclosing solution and compressed air.
☐ 26. *Removes all plaque, soft debris and extrinsic stain from all clinical crowns.

	GENERAL POLISHING PROCEDURE:	COMMENTS:
☐	27. *Produces no tissue trauma.	
☐	28. Uses mirror for maximum vision and/or retraction.	
☐	29. Uses illumination for maximum vision.	

	GENERAL APPOINTMENT PROCEDURE:	COMMENTS:
☐	30. Reviews all patient records prior to beginning procedures.	
☐	31. Performs oral inspection prior to beginning procedures.	
☐	32. Maintains aseptic technique during appointment.	
☐	33. Positions patient for maximum comfort/ accessibility.	
☐	34. Maintains good posture, with face about 18" from patient.	
☐	35. Completes coronal polish in acceptable length of time (as determined by supervisor for the particular patient).	


Buccal
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17
Buccal

CORONAL POLISH EVALUATION CHART

Mark areas on this chart in blue where plaque, soft debris and/or extrinsic stain remain.

A = all tooth surfaces clean

I = 3 surfaces remain unpolished

X = more than 3 surfaces remain unpolished

To complete the case all plaque, soft debris and extrinsic stain must be removed.

Mark areas on this chart in red where gingival tissue has been traumatized.

A = no tissue trauma

I = 1 slight area of tissue trauma (e.g., 1 mmg mildly abraded tissue, etc.)

X = more than 1 area of tissue trauma or 1 very traumatized area, (e.g., lacerated giginval margin, etc.)

STUDY QUESTIONS #2

1. Number the sequence of procedures for performing a coronal polish on a patient (as described in this module).

    _____Determine type of deposits present on teeth. (Have hard deposits removed.)
    _____Polish buccal, lingual, occlusal surfaces with rubber cup and abrasive.
    _____Floss interproximal
    _____Polish interproximal with tape and abrasive
    _____Polish occlusals with brush
    _____Dry teeth and apply disclosing solution

2. T F The patient's mouth should be positioned at approximately the operator's shoulder level in order to maintain optimal comfort and visibility during the coronal polish procedure.

3. When polishing the linguals of anterior teeth, the __________ o'clock position is usually most convenient for the operator.

4. Describe the position of each finger when fulcruming and holding an instrument with a modified pen grasp.

    Thumb:

    Index finger:

    Third finger:

    Ring finger:

    Little finger:

5. What are the purposes for a fulcrum and well-established grasp?

    a.____

    b.____

    c.____

6. On what structures should you fulcrum?

Study Questions #2

7. List three functions of the mouth mirror during coronal polishing:

   a.

   b.

   c.

8. For the handpiece in coronal polishing, the pressure gauge on the dental unit should read ____ to ____ pounds of pressure.

9. The handpiece should be activated before/after touching the tooth with the rubber cup. (circle correct response)

10. Which part of the rubber cup actually polishes the teeth?

    a. a portion of the inner surface of the cup edge
    b. a portion of the outer surface of the cup edge
    c. the middle of the cup
    d. the side of the cup

11. Describe the appearance and position of the rubber cup when polishing the cervical area of the tooth.

12. Describe the kind of strokes used when polishing with a rubber cup.

13. Describe the appearance of gingival abrasion caused by improper use of the rubber cup.

14. Why is it important to have a sequence for polishing?

Study Questions #2

15. Which procedure is followed when using the brush to polish occlusal surfaces?

    a. begin on the ridges move down into the grooves, ending up in the central fossa
    b. beginning in the central fossa, move up into the grooves and end up by going over the ridge

16. Why is it important to keep instruments and operating area free of saliva and excessive polishing agent?

    a. ____

    b. ____

17. How are interproximal surfaces and gingival surfaces of fixed restorations polished?

18. What precautions should be taken when using abrasive polishing strips?

19. Describe the final result of coronal polishing.

ANSWERS TO STUDY QUESTIONS #2

1. Number the sequence of procedures for performing a coronal polish on a patient.

   1 Determine type of deposits present on teeth (have hard deposits removed)
   2 Polish buccal, lingual, occlusal surfaces with rubber cup and abrasive
   5 Floss interproximal
   4 Polish interproximal with tape and abrasive
   3 Polish occlusals with brush
   6 Dry teeth and apply disclosing solution

2. T [✓ F] The patient's mouth should be positioned at approximately the operator's shoulder level in order to maintain optimal comfort and visibility during the coronal polish procedure.

3. When polishing the linguals of anterior teeth, the 11-12 o'clock position is usually most convenient for the operator.

4. Describe the position of each finger when fulcruming and holding an instrument with a modified pen grasp.

   Thumb: across from index finger on same side of shank as rubber cup
   Index finger: across from thumb on side opposite rubber cup
   Third finger: pad on shank of instrument, just a bit closer to rubber cup than index finger
   Ring finger: fulcruming on hard surface near working area
   Little finger: next to ring finger, supplementary fulcrum

5. What are the purposes for a fulcrum and well-established grasp?

   a. stability for controlled action of handpiece or instrument
   b. prevention of injury to patient's oral tissue
   c. comfort for patient to enhance confidence in operator's ability to control manipulation of instrument

6. On what structures should you fulcrum?

   Tooth surfaces or other hard structures.

7. List three functions of the mouth mirror during coronal polishing?

   a. retraction of soft tissue
   b. indirect vision
   c. indirect illumination

Study Questions #2 - Answers

8. For the handpiece in coronal polishing, the pressure gauge on the dental unit should read 10 to 13 pounds of pressure.

9. The handpiece should be activated [✓ before]/after touching the tooth with the rubber cup.

10. Which part of the rubber cup actively polishes the teeth?

    a. a portion of the inner surface of the cup edge

11. Describe the appearance and position of the rubber cup when polishing the cervical area of the tooth.

    Edge of cup and inner surface of edge should be flexed against the tooth so edge can move into gingival sulcus area to clean cervical area of tooth.

12. Describe the kind of strokes used when polishing with a rubber cup.

    Touch and wipe, pat and sweep, short overlapping strokes.

13. Describe the appearance of gingival abrasion caused by improper use of the rubber cup.

    Whitish burned area or raw bleeding area.

14. Why is it important to have a sequence for polishing?

    So all areas are covered.

15. Which procedure is followed when using the brush to polish occlusal surfaces?

    b. begin in the central fossa, up into the grooves, and end up by going over the ridges.

16. Why is it important to keep instruments and operating area free of saliva and excessive polishing agents?

    a. increase vision
    b. helps provide less slippery surface for fulcrum

17. How are interproximal surfaces and gingival surfaces of fixed restorations polished?

    Dental tape is used with polishing agent in a buccal, lingual polish stroke.

Study Questions #2 - Answers

18. What precautions should be taken when using abrasive polishing strips?

    Retract lips and tongue and use a secure fulcrum.

19. Describe the final result of coronal polish.

    The teeth will be free of all hard deposits, extrinsic stain and debris and gingival tissues will not be traumatized.

Coronal Polish
BIBLIOGRAPHY

Hobbs, Evelyn. Coronal Polish, a Self-Learning Instructional Unit for Dental Auxiliary Education, Washington State Commission for Vocational Education, Kellogg Allied Health Education Project, University of Washington, Seattle, Washington; 1976.

Nield, Jill S., O'Connor, Ginger H. Fundamentals of Dental Hygiene Instrumentation, 2nd edition, Philadelphia: Lea and Febiger 1988.

Wilkins, Ester M. Clinical Practice of the Dental Hygienist. 6th edition, Philadelphia: Lea and Febiger, 1989.

Woodall, Irene R.; Dafoe, Bonnie R.; Stutsman Young, Nancy; Weed-Fonner, Leslie; Yankell, Samuel. Comprehensive Dental Hygiene Care, 3rd edition, St. Louis: C.V. Mosby, 1989.